May

25 Cents

Science and Invention

IN PICTURES

The RADIO POLICE AUTOMATON

See Page 14

IN PRIZES $12,000.00 FOR PICTURES

See Page 60

Digitized by Google

Original from UNIVERSITY OF CHICAGO

Dorothy Wordsworth in a letter to Coleridge said: ". . . Yes, do send me a book for my birthday, not a bargain book, bought from a haberdasher, but a beautiful book, a book to caress—peculiar, distinctive, individual.

A book that hath first caught your eye and then pleased your fancy, written by an author with a tender whim, all right out of his heart.

We will read it together in the gloaming, and when the gathering dusk doth blur the page, we'll sit with our hearts too full for speech and think it over."

Dorothy Wordsworth would have found Causation the very epitome of bookish perfection. She would have found in its semi-limp binding, its thin, opaque paper, all that she sought in a bookish book. She would have found it peculiar, distinctive and individual.

But that is not all!

She would have found its contents all that could be asked of a book devoted to the analysis of the fundamental laws through whose operation we live, move and have our being.

Causation has been acclaimed the *wonder book* of this generation. It marks a new epoch, for all men and women think and feel and love and know, but how desperately few *understand!*

It is made to just fit the pocket or hand bag, so that you can have it with you all the time wherever you go, wherever and whenever you have a few moments to spare.

Causation contains the exercises found in the Master Key System.

These exercises are—

The Paths to Power—

The priceless revelations—

The great surprises—

The astonishing truths—

which will come into your life like

The dawn of a new day.

Do you ask the price of the little book?

Nothing at all!

Just send me the names of ten gentlefolk.

Men and women who are attuned to the higher things of life.

THOSE WHO LOVE THE GOOD, THE TRUE AND THE BEAUTIFUL

Those who realize that customs, creeds and cruelty are passing, that vision, faith and service are taking their place.

Let them be persons of education, refinement and culture, but withal enterprising, energetic and progressive.

But above all be sure to send the names of persons who are interested in causes rather than effects, demonstration rather than theory, the practical rather than the abstract.

Theological abstractions, metaphysical subtleties, ecclesiastical dogmas and scholastic technicalities appeal to the intelligent not at all, the acid test now is—will it work.

If obstacles of every kind seem to be placed in your path—if your most cherished plans seem to be thwarted—if you seem to be forced to do the very thing you do not want to do—if your every action seems to be anticipated by invisible enemies—if you are continually humiliated by events which seem to be beyond your control—simply make use of the "Paths to Power" which you will find in Causation—soon

"All your troubles will grow wings
Your life be filled with glorious things."

And so, dear friend, if you will send me these names I will send you a copy of Causation without cost or obligation of any kind, and your name will be used in no way whatever.

You will welcome its coming.

You will soon look upon it as your best friend.

It will brighten and broaden your life.

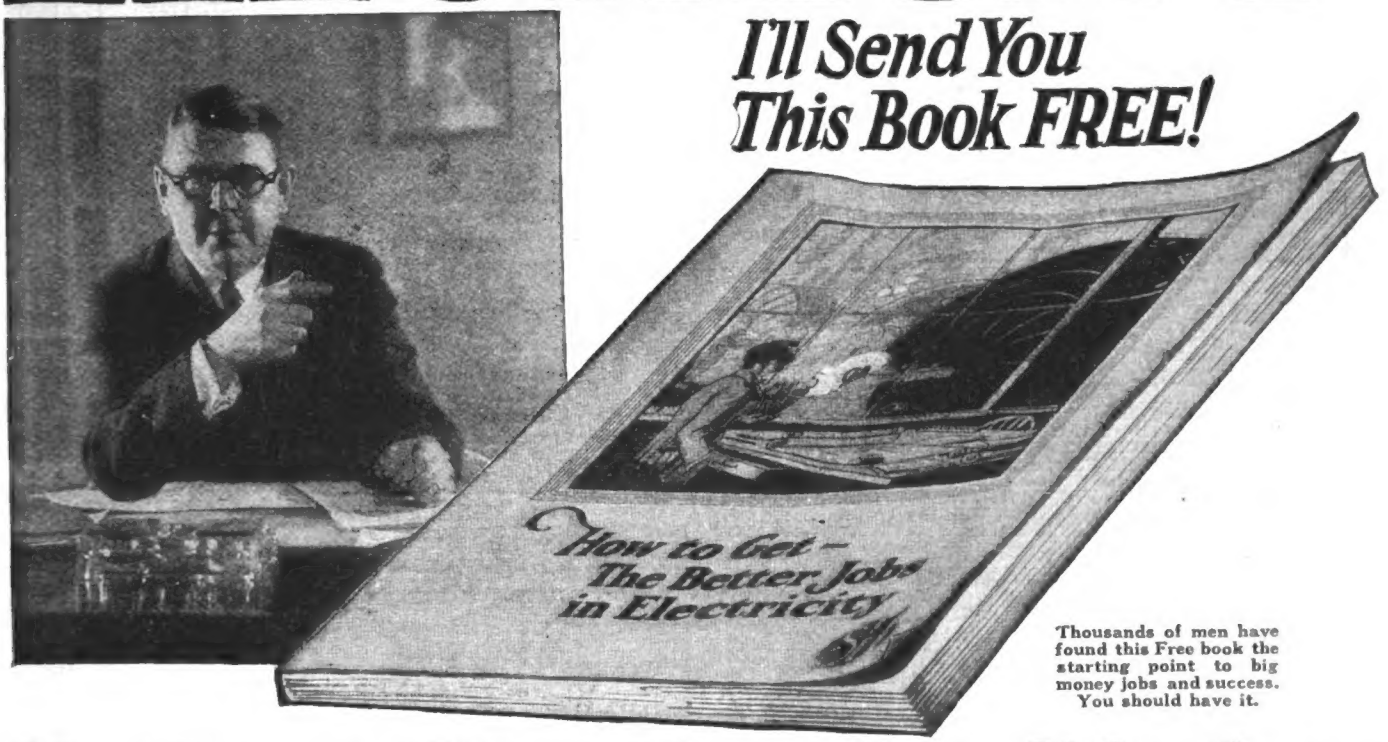
It will bring you the best of the beautiful.

Just send the names and the book will come.

CHARLES F. HAANEL,
221 Howard Bldg., St. Louis, Mo.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

ELECTRICITY



Thousands of men have found this Free book the starting point to big money jobs and success. You should have it.

To Prove You Can Qualify for The Biggest Jobs in 20 Weeks!

You know there is no field in the world that offers such money-making possibilities as ELECTRICITY. And now, thousands are qualifying a new quick way in spare time in their own homes. I will train you in 20 weeks, to step right into jobs paying from $50 to $150 a week. To prove my statement I will send you Absolutely Free a big illustrated booklet which I have just written.

Don't stand back now on account of education, experience, age, or location. No matter where you live, or what you are now doing, through my course you have the chance to become in a very short time a big pay "Electrical Expert."

Actual Shop Methods in Your Own Home

For I have devised the wonderful new copyright Shop Type System that gives you the benefit of Actual Shop Experience in your own home. Never before has this been possible. But now, after finishing my training you will be at home in the biggest electrical plant, in a sub-station, in a battery station, or with expert maintenance men, or in automobile starting, lighting and ignition work because you will have had actual experience, which no other correspondence school can give you, but which means everything.

This new system of teaching electricity has proved so successful that it has been highly recommended and

Endorsed by the Lincoln Institute of Technology

When you enroll you know that you are backed by this institution. You receive free, Employment Service and Expert Advisory Service as long as you live.

Free Outfit

There is such a call for men that we are giving free, an Electrical outfit for experimental and practical home use if you enroll now. Think what it will mean to leave forever the low pay rut, to become a trained, efficient Electrical technician, capable of managing and supervising ten or five hundred men on the biggest jobs; to travel, to be a man of influence — to have a salary of $5,000 to $10,000 per year. Find out now how you can do this. You cannot afford to delay a day. Send right now for this wonderful free book that is pointing the way for thousands to big money in electricity. The coupon brings you this book entirely free, without obligation. Fill it out.

S & H ENGINEERING CO.

Affiliated with the Lincoln Institute of Technology

Dept. E-2, 1422 W. Monroe St., Chicago, Ill.

FREE—FREE OUTFIT COUPON

S. & H. Engineering Co., Chief Engineer Smith,
Division of Lincoln Institute of Technology,
Dept. E-2, 1422 W. Monroe St., Chicago, Ill.
Please send me at once your big book, "How to Get the Better Jobs in Electricity," and full particulars of your course in practical electricity, your free outfit and your free employment service offer. I am not obligated in any way.

Name .....
Address .....
City ..... State .....
If age is under 18 .....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Vol. XII.
Whole No. 133

Science and Invention

FORMERLY
ELECTRICAL EXPERIMENTER

May, 1924
No. 1

Member Audit Bureau of Circulations

PUBLICATION OFFICE: 18,430 Jamaica Ave., Jamaica, N. Y.
EDITORIAL & GENERAL OFFICES: 53 Park Place, New York City

Published by Experimenter Publishing Company, Inc. (H. Gernsback, Pres.; S. Gernsback, Treas.; R. W. DeMott, Sec'y).
Publishers of SCIENCE AND INVENTION, RADIO NEWS, and PRACTICAL ELECTRICS

Table of Contents for May

POPULAR SCIENTIFIC ARTICLES

EDITORIAL.....By H. Gernsback 11
THE THIEF OF BAGDAD.....By Tamar Lane 12
THE RADIO POLICE AUTOMATON...By H. Gernsback 14
GYROSCOPE RACING CAR.....By Clarence A. Snyder 15
AIRPLANE MAKES CONTACT WITH BALLOON..... 15
By Corley P. McDarment
PAPER ON FIELDS INCREASE YIELD.By H. H. Dunn 16
THE SIGNATURE OF SEEDLINGS...By Leonard Bastin 16
BEAUTY CULTURE OF TOMORROW..... 17
By Dorothy Gernsback
THE INFINITE VISION.....By Charles C. Winn 18
THE MAN ON THE METEOR—PART 5..... 20
By Ray Cummings
MORE INTERSTELLAR COMMUNICATION..... 22
By Chevalier De Terrail
WORLD'S HIGHEST CABLE RAILWAY..... 23
By H. Winfield Secor
MARVELOUS ROMAN CLOCK..... 24
By Charles Beecher Bunnell
DRAGON REPRODUCED FOR GERMAN FILM..... 25
By Dr. Albert Neuburger
THE QUEEN'S DOLL HOUSE..... 26
A HOTEL OF POMPEII.....By Charles Beecher Bunnell 27
ODD USES FOR PAPER..... 28
By Ismar Ginsberg, B. Sc. Chem. Eng.
FINE ART IN GLASS BLOWING..... 29
SOME NEW MECHANICAL DEVELOPMENTS..... 30
HOW MOUNTAINS ARE FORMED..... 31
THE HEAVENS IN MAY.....By Isabel M. Lewis, M.A. 32
A GAMBLER'S TRICKS EXPOSED.....By Mark Mellen 33
CHEMICAL HOT WATER BOTTLE..... 34
ELECTRICAL WATCHMAN FOR BOATS..... 34
SOME NEW DISCOVERIES..... 35
AIRSHIP OF SEVENTY YEARS AGO...By John Foley 35
MOVIE KINKS FOR SHIP SCENES...By Phil Gersdorf 36
LOGOTYPE—WRITES A WORD A STROKE..... 36
By Angus Pekerson
WHIRL AMUSES JOY RIDERS..... 37
NOTED SCIENTIST'S INSTRUMENTS..... 37
By Ernest A. Vuilleumier
GAS GUN TO AID POLICEMEN.....By Ernest Jones 37
NEW PHONOGRAPH TEACHES LANGUAGES..... 38
SHIP'S PROPELLER REPAIRED AT SEA..... 38
TIMELY TALKS ON TIMEPIECES—CLEANING YOUR WATCH.....By Samuel Bernard 39
MAGIC FOR EVERYBODY—NO. 14 OF A SERIES..... 40
By Prof. Joseph Dunninger
SCIENTIFIC PROBLEMS AND PUZZLES..... 43
By Ernest K. Chapin

PRIZE CONTESTS

$100 PRIZE AWARDS OF THE CIGAR-BOX CONTEST. 41
PHONOGRAPH NEEDLE CONTEST—$100 IN PRIZES.. 42
HOW-TO-MAKE-IT DEPARTMENT—$30 IN PRIZES MONTHLY 48
$100 CRYSTAL DETECTOR CONTEST..... 54
SCIENTIFIC HUMOR—PRIZES FOR BEST JOKES.... 59
AWARDS OF $1,000 MONTHLY PRIZES..... 60

AUTOMOBILES

GYROSCOPE RACING CAR.....By Clarence A. Snyder 15
FOR CLEAN TIRES..... 34
SOME NEW DISCOVERIES..... 35

ELECTRICITY

BEAUTY CULTURE OF TOMORROW..... 17
By Dorothy Gernsback
MORE INTERSTELLAR COMMUNICATION..... 22
By Chevalier De Terrail
WORLD'S HIGHEST CABLE RAILWAY..... 23
By H. Winfield Secor
ELECTRICAL WATCHMAN FOR BOATS..... 34
SOME NEW DISCOVERIES..... 35
WHIRL AMUSES JOY RIDERS..... 37
LATEST PATENTS..... 58
THE ORACLE—QUESTION AND ANSWER BOX..... 61
PATENT ADVICE.....Edited by Joseph H. Kraus 82

RADIO ARTICLES

RELAY OF RADIO BROADCASTING..... 50
POSITION FINDING BY RADIO....By J. W. Von Stein 51
RADIO EXPERIMENTERS..... 52
NEW USES OF RADIO..... 53
EFFICIENT CRYSTAL RECEIVING SETS..... 54
By A. P. Peck, A. M. I. R. E.
FOUR EXPERIMENTAL CIRCUITS..... 55
RADIO FOR THE BEGINNER—NO. 25—ADDING THE SECOND TUBE.....By Armstrong Perry 56
RADIO ORACLE..... 57
RADIO WRINKLES, Edited by A. P. Peck, A. M. I. R. E. 86

CONSTRUCTOR ARTICLES

MINIATURE RAILWAY TUNNEL...By W. W. Douglas 45
PORTRAIT ATTACHMENT FOR CAMERAS..... 45
By Edward H. Flaharty
AN INEXPENSIVE TELESCOPE.....By Don Home 46
A GYROSCOPIC PLUMB BOB.....By C. A. Oldroyd 46
DECORATIVE OBJECTS IN RELIEF...By S. W. Ross 47
A LABORATORY VACUUM PUMP.....By Dr. E. Bade 47

CHEMISTRY ARTICLES

ODD USES OF PAPER..... 28
By Ismar Ginsberg, B. Sc. Chem. Eng.
CHEMICAL HOT WATER BOTTLE..... 34
GAS GUN TO AID POLICEMEN.....By Ernest Jones 37
EVERYDAY CHEMISTRY.....By Raymond B. Wailes 44
WRINKLES, RECIPES AND FORMULAS..... 49
Edited by S. Gernsback

ASTRONOMY ARTICLES

THE INFINITE VISION.....By Charles C. Winn 18
MORE INTERSTELLAR COMMUNICATION..... 22
By Chevalier De Terrail
THE HEAVENS IN MAY.....By Isabel M. Lewis, M.A. 32

HOW TO SUBSCRIBE FOR "SCIENCE AND INVENTION." Send your name, address and remittance to Experimenter Publishing Co., 53 Park Place, New York. Mention the name of the magazine you are ordering. We also publish RADIO NEWS and PRACTICAL ELECTRICS.

RATES AND TERMS. The subscription rate for SCIENCE AND INVENTION is $2.50 per year (12 numbers.) When remitting do so by check, money order or registered letter, if cash is enclosed. Avoid sending cash through the mail if possible. Subscriptions for less than one year are not accepted. Subscriptions may be made in combination with RADIO NEWS or PRACTICAL ELECTRICS with considerable saving. Send postal for special rates. Subscriptions start with the current issue, unless otherwise ordered.

POSTAGE. We prepay postage in all parts of the United States, Mexico and island possessions. For foreign or Canadian subscriptions we require 50 cents in addition to the subscription price for additional postage charges.

CHANGE OF ADDRESS. Notify us as far in advance as possible. It requires several weeks to make an address change on our records. Always write clearly, giving your old address as well as your new.

ON EXPIRATION of your subscription we enclose a renewal blank in our last number to you and notify you otherwise. Unless we receive your order for a renewal, with your remittance, we stop our delivery to you on expiration.

COMMUNICATIONS to us should always bear your full name, address and when possible the number which appears on your wrapper every month.

SCIENCE AND INVENTION is published on the 25th of each month. There are 12 numbers per year. Subscription price is $2.50 a year in U. S. and posaessions. Canada and foreign countries $3.00 a year. U. S. coin as well as U. S. Stamps accepted (no foreign coin or stamps). Single copies, 25 cents each. A sample copy will be sent gratis on request. Checks and money orders should be drawn to order of EXPERIMENTER PUBLISHING CO., Inc. If you change your address notify us promptly, in order that copies are not miscarried or lost.

All communications and contributions to this journal should be addressed to Editor, SCIENCE AND INVENTION, 18,430 Jamaica Avenue, Jamaica, New York, or 53 Park Place, New York City, N. Y. Unaccepted contributions cannot be returned unless full postage has been included. ALL accepted contributions are paid for on publication. A special rate is paid for novel experiments; good photographs accompanying them are highly desirable.

SCIENCE AND INVENTION. Monthly. Entered as second-class matter at Jamaica, N. Y., Post Office, under act of Congress of March 3, 1879. Title Registered at the Patent Office. Copyright, 1924, by E. P. Co., Inc., New York. The Contents of this Magazine are copyrighted and must not be reproduced without giving full credit to the publication.

SCIENCE AND INVENTION is for sale at all newsstands in the United States and Canada; also at Brentano's, 37 Avenue de l'Opera, Paris. Member of the Audit Bureau of Circulations.

New York City
General Advertising Dept.,
53 Park Place

Western Advertising Representatives.
Finucan & McClure,
720 Cass St., Chicago, Ill.

Pacific Coast Advertising Representatives.
A. J. Norris Hill Co.,
Hearst Bldg., San Francisco, Calif.

Kansas City Advertising Representatives.
George F. Dillon,
Republic Building, Kansas City, Mo.

Digitized by Google

UNIVERSITY OF CHICAGO

Give Me 15 Minutes a Day and I'll Grow New Hair for You In a Month — *Or No Cost!*

I have grown new hair for hundreds of others in 30 days. If I can't do the same for you —I don't want to keep a cent of your money. Let me send you—absolutely free—the evidence of what my new method has done for others. Just mail the coupon below.

By **ALOIS MERKE**

Founder of Famous Merke Institute, Fifth Ave., N. Y.

I REALIZE that I'm making an exceptional offer. I realize that probably no one ever dared to make such an offer before. But I mean every word I say. Give me 15 minutes a day for one month. And no matter how thin your hair may now be—my treatment will give you a new growth of hair in 30 days—or the test won't cost you a cent.

Sounds too good to be true—doesn't it? But I have already grown new hair for hundreds of others—many of whom had long ago despaired of regaining their hair. And if I can't do the same for you—just tell me so. There will be no red-tape or bother. Without asking a single question I'll instantly and gladly mail you a check refunding every cent you have paid me. That's my absolute GUARANTEE. I don't want your money unless—after 15 minutes of your time each day for a month—I grow new hair on your head.

Entirely New Method

Up to now many people believed that when hair fell out and ordinary measures failed to grow new hair that the roots were always dead. But from close observations made while treating hundreds of cases of thin, scanty falling hair—I found that in a very great many instances the hair roots were *not dead*—but merely *dormant*. The question is how in the world can hair-tonics and so called "restorers" ever grow hair when they do not even *approach* the cause of falling hair—dormant hair roots.

You would never think of rubbing "growing fluid" on the leaves of a dying plant and expect the plant to grow. Instead you would get right down to the roots and nourish them. It is exactly the same with the hair.

My treatment is the result of long years of experience spent at Heidelberg, Berlin, Paris, Cairo, Geneva and other centers of scientific research. And I believe that—for the first time in the history of dermatology—my method provides a means of penetrating *directly* to starving hair roots and supplying them with nourishment to make them grow new hair.

WHAT USERS SAY

Scores of Other Letters Tell the Same Story

Hair Growth After 3 Weeks

"Your treatment so far is nothing short of being wonderful. New growth started after three weeks' treatment. Dandruff entirely gone. Scalp is loose, healthy and am on the way to a new head of hair. My fears of baldness are gone forever. You may use my name and testimonial."—A. McK., Lakeview, N. J.

Hair About Gone

"I have now used your treatment 2 months and although I nearly lost my hair entirely and have been bald for 8 years, I was much surprised to see the improvement it has made for me in this short time. I think ten times the price of what I paid for it would not be any too much for it."—N. R. B., Glen Cove, N. Y.

Results Very Gratifying

"I have used your Thermocap Treatment for 8 weeks and although the top of my head has been entirely bald for 6 years, the results up to the present are very gratifying. In fact, the entire bald spot is covered with a fine growth of hair."—W. A. C., Kenmore, O.

Results Guaranteed — Or No Cost

Already at the Merke Institute, Fifth Avenue, New York, which I founded, prominent stage and social celebrities have paid as high as $500 for the results secured by personal treatments. Yet now through my new home treatment these very same results may be obtained right in your own home, *and for just a few cents a day!* The treatment may be taken in any home in which there is electricity. Hundreds of men and women who only recently were suffering from loss of hair have through this method acquired hair that is the envy and admiration of many of their friends. And as for dandruff and similar scalp disorders, they usually disappear after the first few treatments. Remember, I do not ask you to risk one penny. You try it on my absolute GUARANTEE that if after using my treatment for 15 minutes each day for a month you are not more than delighted with the growth of hair produced, then I won't keep a cent of your money.

Free Booklet Explains Treatment

If you will merely fill in and mail the coupon below I will gladly send you—without cost or obligation—an interesting 32-page booklet, describing my treatment in detail.

This booklet contains much helpful information on the care of the hair—and in addition shows by actual photographs what my treatment is doing for others.

No matter how much hair you have lost, this booklet will prove of deepest interest to you. So mail the coupon now—and it will be sent to you by return mail.

ALLIED MERKE INSTITUTES, Inc.
512 Fifth Avenue, New York City Dept. 464

ALLIED MERKE INSTITUTES, Inc.
Dept. 464, 512 Fifth Avenue, New York

Please send me, without cost or obligation on my part, a copy of the new booklet describing in detail the Merke Institute Home Treatment.

Name .....
(State whether Mr., Mrs., or Miss)

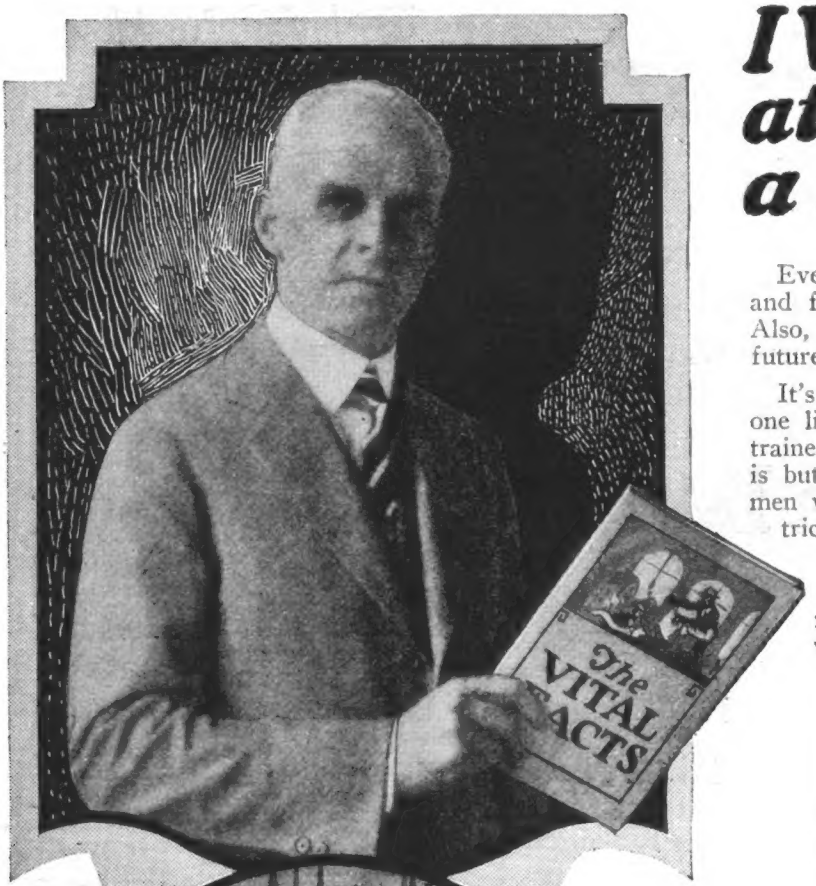
Address .....

City ..... State .....

Digitized by Google Original from UNIVERSITY OF CHICAGO

Electrical Experts

I Will Train You at Home to Fill a Big Pay Job



Every man knows that Electricity is the biggest and fastest growing industry in the world today. Also, that no other line of work offers half the future—half as many chances for advancement.

It's THE FIELD OF OPPORTUNITY, the one line where positions are more numerous than trained men to fill them, where $75 to $100 a week is but a fair starting salary; where the Experts, men who have been trained, and who know Electricity as you know your A B C's—make $10,000 a year and more.

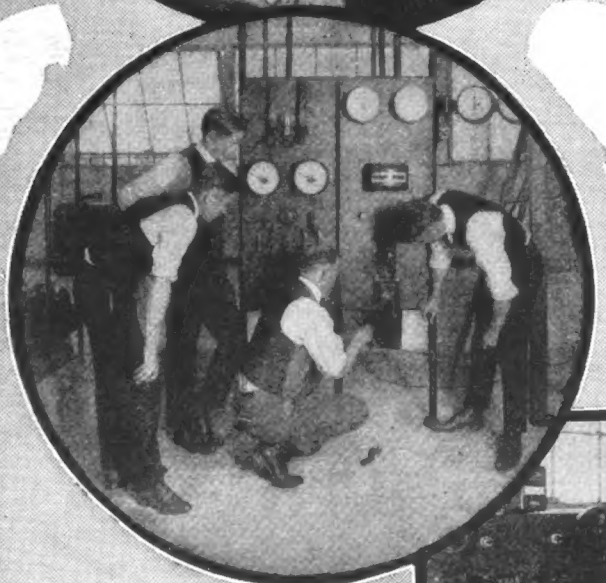
But it's a field where ANY man can quickly reach the top, providing he is ambitious, and willing to learn.

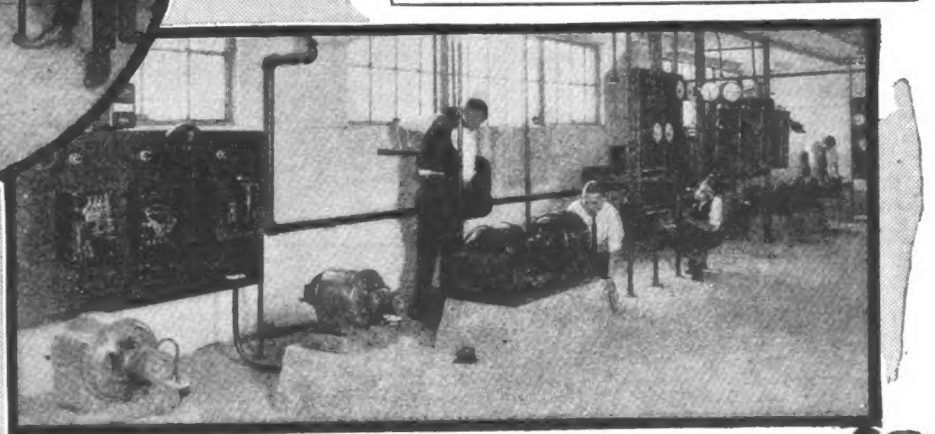
FREE Use of My Big Electrical Laboratory

The pictures below show two groups of students doing special work in the C. E. W. Laboratory. This laboratory is a wonderful place, filled with thousands of dollars' worth of the very latest type of electrical machinery and apparatus. Here my students may come for special work, or to work out ideas and inventions of their own. And there is no charge—the use of this laboratory is absolutely free, not only while you are studying, but afterwards, and you may come as often as you like.

And that isn't all. So far as I know the Chicago Engineering Works is the only Correspondence School in the United States that offers free accommodations for *its* visiting students. We maintain at the Y. M. C. A. in Ravenswood, right near our plant, rooms for such students, and with these rooms go all of the privileges of the "Y"—the "Gym," the "Swimming Pool," Billiard Room, etc.

And there is absolutely no charge for these rooms—visiting students pay only for their meals. It's just another feature of our wonderful Student Service. But it's these things that make "Cooke" training the *best* training in the world. **Be a "Cooke" trained Electrical Expert.**





Above. Inspecting construction of switchboard and automatic circuit breaker in C. E. W. Laboratory. Right: View along west wall of C. E. W. Laboratory.

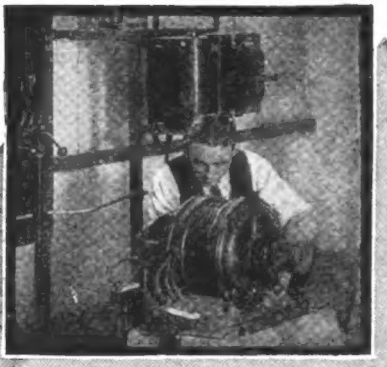
The "Cooke" Trained Man is the "Big Pay" Man

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Are in Big Demand

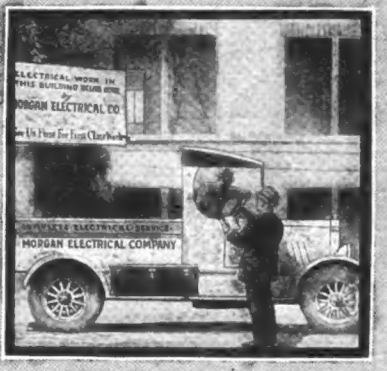
Fit Yourself for a Big Pay Job

Cooke Trained Men Earn $70 to $200 Weekly



Herbert Dickersen, C. E. W. Graduate, Warrenton, Va., Makes $7,500 a Year.

Automotive Electricity Pays W. E. Pence, C. E. W. Student, Albany, Oregon, Over $9,000 a Year.



J. R. Morgan, C. E. W. Student, Columbus, Ohio, Makes $30 to $50 a Day in Business for Himself

Now you earn $20 or $30 or $40 a week. In the same six days as an Electrical Expert you can make $70 to $200 and make it easier—not work half so hard. Why, then, remain in the small-pay game, in a line of work that offers no chance, no big promotion, no big income? Fit yourself for a "bossing" job—

Earn $3500 to $10,000 a Year

As Chief Engineer of the big Chicago Engineering Works I know exactly the kind of training you will need to make you an Electrical Expert, and I will give you that training, *in your own home,* through my easily learned, quickly-grasped, right-up-to-the-minute, spare-time home-study Course in Practical Electricity. No big words, no wading through a lot of dry mathematics, no useless theory; just a practical, workable knowledge of Electricity, taught in a practical, workable way, by the most practical and successful School in America.

FREE Electrical Working Outfit

With me you do Practical work—at home. You start right in after the first few lessons to work at your profession in a practical way. For this you need apparatus—tools, instruments, materials and supplies—and I give them to you absolutely free, the biggest, best and most expensive Working Outfit ever sent out by a Correspondence School.

Earn As You Learn

With me, again, you earn as you learn. Right at the start I give you a short Special Course in a branch of Electricity that will enable you at once to make money in your spare time. Hundreds of my students have paid for their entire Course in this way.

No Previous Experience Necessary

It is not necessary that you ever should have done electrical work, or that you know anything about Electricity. You can read. You can write. You can think. And that's enough. My training will do the rest, and will positively insure your success in Electricity.

Your Money Back If You Are Not Satisfied

You take absolutely no chance. If, when you have finished my Course, you are not entirely satisfied with the results, I guarantee now to return every penny you have paid me. And back of me, in my guarantee, stands the Chicago Engineering Works, a million dollar institution.

Investigate! Mail Coupon

Get the Vital Facts. Let me send you free my big new book on The Future of Electricity. Let me tell you more about the big demand for "Cooke" trained Electrical Experts. Sign and send me Coupon below.

L. L. COOKE, Chief Engineer
CHICAGO ENGINEERING WORKS, Inc.
2150 Lawrence Avenue
Dept. 25 **Chicago, Ill.**

Mail this Coupon for my FREE BOOK

L. L. COOKE
Chief Engineer
Chicago Engineering Works,
Dept. 25, 2150 Lawrence Ave.,
Chicago, Ill.

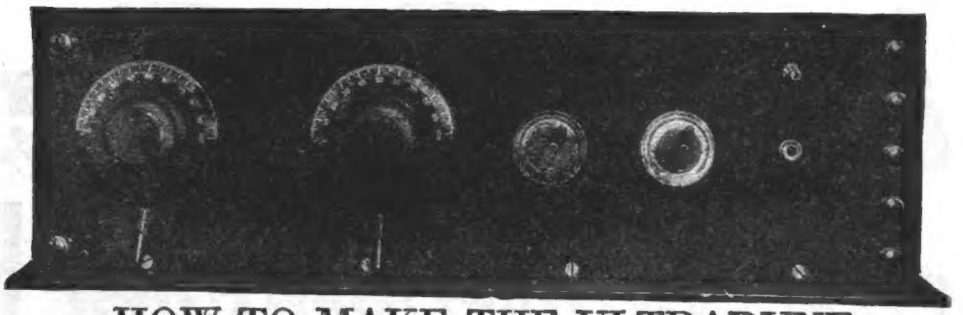
Dear Sir:—Send at once the "Vital Facts" containing Sample Lessons, your Big Book, and full particulars of your Free Outfit and Home Study Course—all fully prepaid, without obligation on my part.

Name.....
Address.....
City and State.....
Occupation.....

Be a "Cooke" Trained Electrical Expert

Digitized by Google · Original from UNIVERSITY OF CHICAGO

Just off the Press

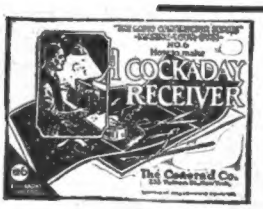


HOW TO MAKE THE ULTRADYNE

This receiver is the last word in improved Super-heterodynes. It employs six tubes and is, without doubt, the most sensitive circuit in existence at the present time. It employs what has been called the "Modulation system" of rectification in place of the usual "frequency change" of the received radio currents as in the standard Super-heterodyne.

The description of this Pattern is written by R. E. Lacault, who devised the Ultradyne; thus, the constructor can feel assured that he is following authentic data.

Complete instructions given in a Four-Page Pamphlet, one large Blue-Print Pattern showing Perspective Wiring Diagram, Coil Winding Forms, Full Size Panel Layout and details for building a cabinet. Contained in a heavy two-color printed envelope. Size 9 x 12 inches. **PRICE 50c**



"CONSRAD"
Make Your Own
Patterns

No.

1 How to Make a Short Wave Regenerative Receiver.

2 How to Make a Two Stage Amplifier.

3 How to Make a Radiophone Crystal Set.

4 How to Make a Reinartz Receiver.

5 How to Make a Reflex Receiver.

6 How to Make a Cockaday Receiver.

7 How to Make a Neutrodyne Receiver.

8 How to Make an Autoplex Receiver.

9 How to Make the ST 100 Receiver.

Packet B 20 Radiophone Diagrams with Supplements.

Packet C 14 Radio Formulae and Diagrams.

Packet D All About Aerials and Their Construction.

Packet E Radio Amateur's Practical Design Data.

PRICE 50c EACH

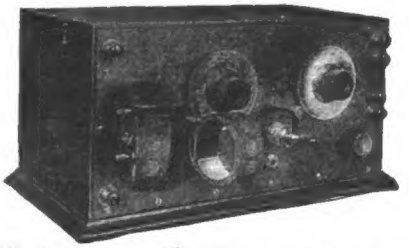
Pattern No. 9
The S. T. 100 Receiver

The S. T. 100 receiver employing a circuit devised by John Scott-Taggart, of London, is one of the most efficient sets of reflex variety.

While only two tubes, a crystal detector are used, the energy amplified of incoming signals is powerful enough to operate all loud speakers without additional amplification.

Another important feature is that the set tunes sharply, which is one of the utmost requisites of an ideal receiver.

The packet consists of blue prints for drilling the panel, wiring the apparatus, and a four-page instruction pamphlet giving complete details as to the parts required, tools needed, and even how to tune.



All these are contained in a two-color heavy manila envelope, 9½ x 12".

PRICE 50c

Broadcast Stations
Made Easy to Locate

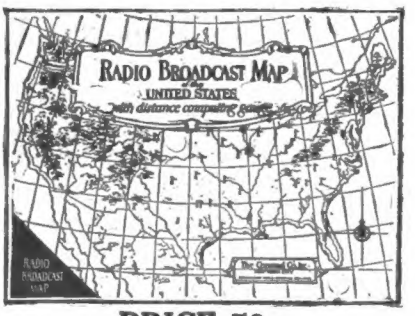
The Consrad Radio Map is different from all other maps in that it is printed on CLOTH. With proper care will last a lifetime.

The Map measures 17 x 22" and contains a special distance computing gauge of our own design which enables one to determine the distance in miles between any broadcast station and his receiving set at a glance.

Another special feature of this map is a novel Finder device for locating a broadcast station in quick time.

A complete list of broadcast stations are given on a separate sheet which can be fastened to the map by ordinary paper fasteners.

The map furnished in two colors with the sheet of broadcast stations, enclosed in a two-color heavy manila envelope 9½ x 12 inches.



PRICE 50c

THE RADIO READING COURSE

Here is Your Chance to Learn All You Can About RADIO

The $10.00 "Radio Reading Course"

All the technical details and a thorough explanation of radio reception, written in easily understood, non-technical language by a foremost radio engineer and inventor. The five Lecture Books with over 100 graphic drawings give you the knowledge to intelligently buy, design, build, operate and maintain radio receiving apparatus. This set of five handsome Lecture Books are a complete radio library.

SPECIAL AT $1.25

THE CONSRAD COMPANY

Publishers and Sales Agents

233 Fulton Street **New York City**

Digitized by Google
Original from UNIVERSITY OF CHICAGO

They Started Where You Are Today

Charles P. Steinmetz

Thomas Edison

Make Your Start Today

The new book "Be a Power In Electricity" shows you how such men as Tesla, Marconi, Bell, etc., won their laurels in Electricity. What they did you can do. This book is the first step. Write for your Free Copy today. No obligation. Use the coupon.

AMERICAN SCHOOL
Electrical Division
Chicago, U.S.A.

Nikola Tesla

Samuel Morse

Alexander G. Bell

Guglielmo Marconi

AMERICAN SCHOOL, Dept. E 526, Drexel Ave. & 58th St., Chicago ©A.S.1924
Please send me your free booklet "Be a Power In Electricity." This request puts me under no obligation.

Name .....

Occupation .....

Address .....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

TIPS!

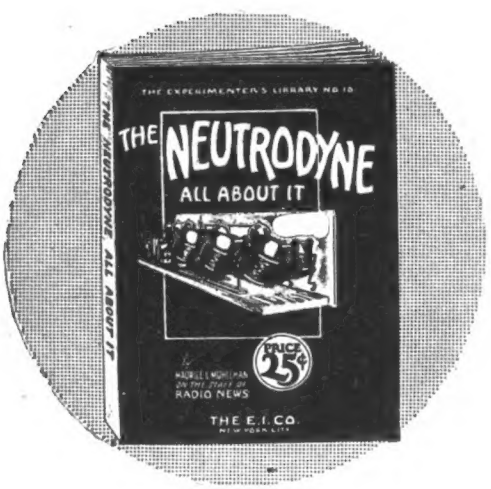
FOR THE

Radio Amateur Constructor

The Latest Book of the Experimenters' Library: It gives everyone the inside tricks on constructing his own Radio Set. It combines the experience of an Expert Set Builder. It is of value to everybody. One chapter is devoted exclusively to the fine points of drilling the Radio Panel and Cabinet. Another to the Mounting of the Instruments and so on till every detail of Radio Set Construction is covered. This Book is now in Circulation. Ask your dealer for a copy.

PRICE 25c

THE NEUTRODYNE
ALL ABOUT IT



Twenty-one Chapters on the Neutrodyne are covered in this neat, handy book. Anyone interested in the Neutrodyne Set and how it works should have a copy. It is complete to the smallest detail—such as "Locating Trouble," "Adding Regeneration," "Drilling the Panel" etc. The book covers only the up-to-the-minute data. It is an advance in Radio Literature. Get a copy now.

PRICE 25c

Other Books in the
EXPERIMENTERS LIBRARY

PRICE 25 CENTS EACH

RADIO FREQUENCY AMPLIFICATION
ALL ABOUT RADIO PARTS
HISTORY OF OPERATION OF THE VACUUM TUBE
HOW TO MAKE RADIO-PHONE RECEIVING SETS
RADIO QUESTIONS ANSWERED
LOUD TALKERS
HOW TO TUNE YOUR RADIO SET
100 RADIO HOOKUPS

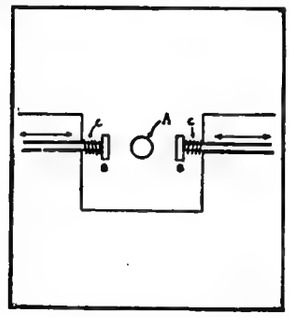
AT ALL RELIABLE DEALERS

THE E. I. COMPANY (*The Consrad Company, Selling Agents*)
233 FULTON STREET NEW YORK CITY

Digitized by Google Original from UNIVERSITY OF CHICAGO

A Problem in Invention Can You Solve It?

This simple test will show whether or not you have inventive ability; thousands have it and do not know it, or *do not develop it.* Yet invention is the easiest way to earn a fortune. No technical or scientific knowledge necessary. Read below a few instances of how little ideas have made millions of dollars for their inventors.



Here is an interesting problem in invention. Its solution will be found very simple, if we really think.

"A" is the end of a shaft. The two members "B B" are free to move in either direction indicated by the arrows. If they are pushed back, the springs "C C" will immediately pull them forward again.

Our problem is to put some kind of an attachment on the revolving shaft "A" so that the members "B B" will be pushed back both at the same instant every time the shaft "A" makes a single revolution. The device on shaft "A" must also allow the two members "B B" to come forward once in every revolution. What would you suggest putting on the shaft "A"?

HOW would *you* like to get the royalty paid to the inventor of the tin cap used on millions of bottles? How much money would *you* have now had you thought of the simple idea of putting rubber tips on pencils? Wouldn't you gladly be the inventor of the Gillette Safety Razor, who it is said made as much as TWO AND ONE-HALF MILLION DOLLARS *a year,* or the inventor of the tiny snap-fastener who recently paid an *income tax* of $29,000, or be the man who invented the President Suspenders, now worth $5,000,000? Or would you prefer to be the inventor of the autographic attachment for cameras who sold his patent rights for $300,000.

Ideas Worth Fortunes

One single idea—as simple as any of these—can make you independently wealthy in a short time. Other inventors have made hundreds of thousands of dollars from such common things as the crimped hair-pin, the metal-tip shoe lace, the paper safety match, the ordinary wire paper clip. These are certainly not complicated inventions—they are so simple, in fact, that probably *thousands* of people thought of them but only *one* man DID anything about the idea when it came to him.

Raymond F. Yates, who with fourteen other famous inventors, now makes it easy for you to learn how to invent in your spare time at home.

You, too, probably have ideas for needed inventions—and the only reason you have not turned your ideas into gold is because, like thousands of other persons, you doubt your own ability. Or, like most persons, you believe that every inventor is a genius who invents things as naturally as other people do their work as bookkeepers, mechanics, doctors or farmers.

Invention Can Be Learned

But this is not true. What were our great inventors *before* they invented anything. Bell was a teacher. Edison was a telegrapher. Gillette and Waterman were traveling salesmen. Better proof than this is that you can satisfy yourself that invention is not limited to geniuses or that it is merely guesswork, luck or chance. You can prove to yourself that invention—*any* invention, from the collar button to the colossal railroad engine—is the result of the same kind of thought that you use in adding a row of figures.

Think, for a moment, what you do in any example in addition. You *see* a problem—the row of figures. You recognize that a result is wanted—the sum of the figures. From these two facts you go ahead and get the result. And because only one answer can be correct for that particular example, you know your problem is solved when you find that answer.

Proof YOU Can Invent

Exactly the same thing is true in invention. This is the proof. At the top right-hand corner of this page is shown a simple problem in invention. What would *you* put on a shaft "A" to force members "B B" to move back at the same time. A little thought will show you the correct answer within a few minutes.

This test of your inventive ability, simple as it is, illustrates the thought behind every invention. Like your arithmetic example you see first, a problem to be "fixed." Then you think of something which will "fix it," something which is the only correct answer to your problem. That is all—that is *everything* — to invention.

What Edison Says

Could you ask the advice of any greater authority than Thomas A. Edison? He says: "Invention is a Science and should be taught as a profession."

And now for the first time you can profit by Edison's advice. You can actually learn invention as a profession—exactly as other people are learning electricity, mechanics, law, medicine.

The Bureau of Inventive Science offers you the first course in practical invention ever devised. It has written down the easy-to-learn principles of Inventive Science so that everybody can read them and learn to use them. It doesn't matter who you are, or what your present work is—you have the native ability to invent. It was *born* in you. What you need now is to develop this ability so you can use it to produce inventions. All you need, to become successful, is this easy, fascinating training which will develop your ability so it will be worth real money. Fifteen famous inventors tell you WHAT TO INVENT and HOW TO INVENT. They tell you the secrets of inventions which every successful inventor knows. They explain how to originate ideas, how to develop and perfect them, how to get patents. But they tell you even more: Thousands of inexperienced inventors have been defrauded of their rewards because they did not know how to protect their patent rights. This great course tells you everything you want to know—how to sell your invention, how to get royalties—how to get the most money for your ideas.

15 great inventors teach you every step in inventive science.

—How to develop your imagination.
—How to develop your ideas.
—How to get the facts you need for inventions.
—How to keep legal records of ideas.
—How to use scientific principles of mechanics.
—How to avoid wasting time on impractical inventions.
—How to apply for a patent.
—How to organize a company.
—How to protect your rights.
—How to market a patent.
and hundreds of other vitally important facts which EVERY successful inventor knows and uses.

New FREE Book

The most fascinating part of this great new course is that it teaches invention by actual practice, right in your own home. No special knowledge of mechanics or science is necessary. With each lesson you are sent some problem in invention—just like the one you worked out here. This fascinating exercise in solving actual problems in invention sharpens your instinct to fix things, gives you an unforgetable, instinctive habit of thinking inventively worth more than you realize. In fact, the lessons and exercises are so simple, so easy to understand, so interesting, that they seem more like a pleasant game than like instruction which can make you a successful inventor.

A wonderful new book, just printed, tells you more about the Bureau of Inventive Science and its simple new course in invention. It costs nothing, so send the coupon at once. Every day you see things which must be improved. Every day you run into problems which a simple idea can solve. It may be a new toy for your children. The man who invented the Kiddie-Kar, it is reported, made over $5,000,000. It may be a new kind of soap. E. T. Babbittt is worth millions of dollars today. It can even be a new kind of broom to make housework easier for millions of housewives. But no matter what it is—if your idea is practical, if it solves a problem, if it satisfies a need—a fortune may be waiting for you. This bureau is not connected with patent attorneys or manufacturers. Its only purpose is to teach you the principles of practical invention used by every successful inventor. Write for the FREE BOOK now.

Bureau of Inventive Science
Dept. 75
Wisner Building Rochester, N. Y.

Bureau of Inventive Science,
Dept. 75, Wisner Building,
Rochester, N. Y.

Please send me your free book, "The Science of Invention."

Name .....Age.....

Address .....

City .....State.....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Master Electricity By Actual Practice

The only way you can become an expert is by doing the very work under competent instructors, which you will be called upon to do later on. In other words, *learn by doing.* That is the method of the New York Electrical School.

Five minutes of actual practice properly directed is worth more to a man than years and years of book study. Indeed, Actual Practice is the only training of value, and graduates of New York Electrical School have proved themselves to be the only men that are fully qualified to satisfy EVERY demand of the Electrical Profession.

The Only Institution of the Kind in America

At this "Learn by Doing" School a man acquires the art of Electrical Drafting; the best business methods and experience in Electrical Contracting, together with the skill to install, operate and maintain all systems for producing, transmitting and using electricity. A school for Old and Young. Individual instruction.

Over 8,000 Graduates are Successful Men in the Electrical World

No previous knowledge of electricity, mechanics or mathematics is necessary to take this electrical course. You can begin the course now and by steady application prepare yourself in a short time. You will be taught by practical electrical experts with actual apparatus, under actual conditions.

The N. Y. E. S. gives a special Automobile Ignition Course as an advanced training for Auto Mechanics, Garage Men and Car Owners. The course covers completely all Systems of Ignition, Starters, Lighting and other electrical equipment on automobiles, motor boats, airplanes, etc.

Let us explain our complete courses to you in person. If you can't call, send now for 64-page book—it's FREE to you.

New York Electrical School
29 W. 17th St., New York, N. Y.

Please send FREE and without obligation to me your 64-page book.

..... NAME

..... STREET

.....CITY ..... STATE

New York Electrical School

29 West 17th Street, New York

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Volume XII
Whole No. 133

Science and Invention

MAY
1924
No. 1

H. GERNSBACK, EDITOR AND PUBLISHER
H. WINFIELD SECOR, ASSOCIATE EDITOR
T. O'CONOR SLOANE, Ph.D., ASSOCIATE EDITOR
Editorial and General Offices, - - - 53 Park Place, New York

"Those Who Refuse to Go Beyond Fact Rarely Get As Far As Fact" -- HUXLEY

Inventing As A Business

By H. GERNSBACK

EDISON once was asked by a visitor as to the secret of his inspiration. The visitor was told by him that inventing was "2 per cent inspiration and 98 per cent perspiration." Probably nothing more true has ever been said. The public is still fascinated by the legend that great inventors are born. They consider it a gift the same as any other natural gift. This, however, is only partially true. To be sure there may be people who work by inspiration only when making inventions. But it is the writer's belief that such indeed are very rare.

I BELIEVE
¶ THAT all really great ideas are simple.

The modern inventor pursues entirely different tactics. In the first place, and this is the writer's advice to would-be inventors, *make up your mind what you desire to invent and then go after it.* Inventing falls into two classes—useful and useless inventions. The first one includes all such devices for which there is an immediate demand because the intended device fills a need not covered at present. The useless class covers those devices which are invented only for the fun of inventing but which nevertheless may be useful in the future. For instance, a man might have invented the vacuum tube such as is used today in radio 50 years ago. It would then have been a useless invention because it could not be used at that time. Today, however, it is a tremendously valuable device.

Practical inventions are of course important all the time as a rule, and Edison for instance has in general made it a rule to concern himself only with devices for which there was an apparent immediate demand.

I BELIEVE
¶ THAT every inventor should take a course in business —he needs it.

From the letters that come into this office by the hundreds almost every day, it can be easily seen why there are so many disappointed and disgruntled inventors now in the world. The average inventor gets an idea and then spends every cent he has in perfecting it. After months or years of toil when the device finally works he tries to obtain a patent only to find to his dismay that the idea has long been known in one way or another. This shows how not to do it.

The correct and modern way is as follows: If you have an idea, the first thing should be to spend a reasonable amount of money in literature such as text-books or specialized books treating on the subject and *try to learn everything about the particular article.* You can spend no more fruitful hours in your own or public library than those devoted to find out ALL about your device. Often you will be surprised to see how many have had practically the same idea. If you cannot find any references in the public library or public press, then you had better get in touch with a patent attorney who will make a search in the patent office and will send to you copies of all the patents that have been issued on the particular class of device such as the one you are now working on. This course is the best one to take as a rule, because a patent attorney who knows his business will pick out references that may be exceedingly valuable to you.

I BELIEVE
¶ THAT ideas make the world go round.

You can also write to the patent office and procure from them copies of some of the existing patents at ten cents for each copy.

After you have ascertained all the facts and you find that your device is original, you can then go ahead with experiments, and model-making with a clear conscience. Even now the battle is not won. It has happened in the past, for instance with the Bell Telephone, that exactly the same idea was filed for patenting on the self-same day by two inventors who did not even know each other. For that reason if you have a good idea and if you desire to obtain a patent on it which may be valuable, speed is necessary after you have once ascertained that the device in question has not as yet been patented. Even a few days' delay may cost you dearly as many inventors have found out to their sorrow. As a rule inventions seem to "be in the air". As the arts and sciences advance the needs for certain devices become apparent, and as a rule many independent investigators start work at the same time. The man who gets to the Patent Office first usually wins.

We say "usually wins," for it has happened many times in the past that even when a patent had actually been granted to Smith, the battle was not won. Jones, another inventor, may have been working on the same idea before Smith, who obtained the patent, even started his work. If Jones can prove afterwards by documentary evidence and witnesses that his day of conception antedated the one of Smith, then Smith's patent may be declared null and void.

For this reason the careful inventor as soon as he has conceived an idea, writes it down on paper and makes as many sketches as possible illustrating the device. He then takes it to a Notary Public at once, with as many witnesses as he can find and has the document sworn to.

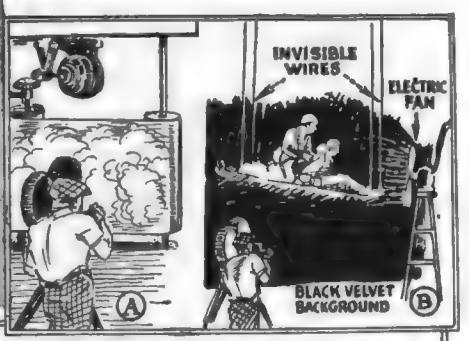
THE GOLDEN AGE OF SCIENCE

is now symbolized by the golden cover of SCIENCE & INVENTION. LOOK FOR THE GOLD COVER every month!

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Mechanical Marvels of

By TAMAR LANE

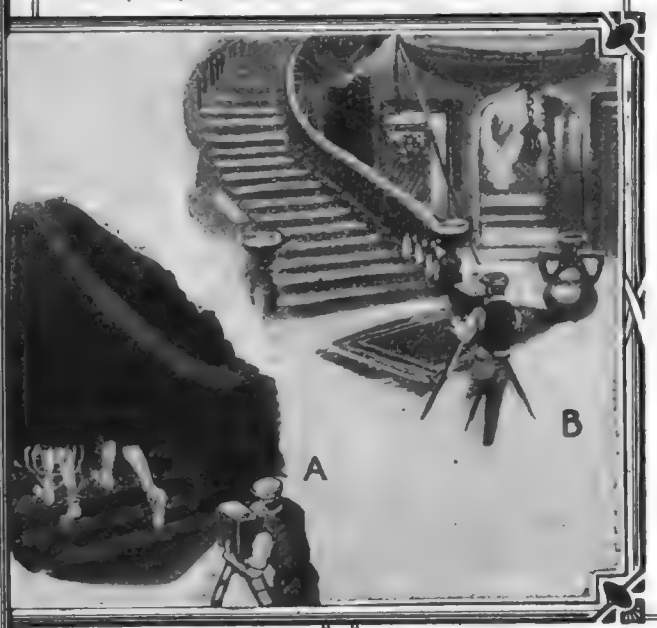


The director said to the engineer, "Let there be a Flying Carpet," and here is the result. The carpet, on a wooden frame, was supported by steel piano wires. It was photographed against a black background and then the film was re-exposed to clouds painted on a rolling canvas, as shown at A above. At B is depicted the carpet suspended and the fan furnishing a breeze as if in flight.

IT is the most perfect piece of movie mechanics that the year has produced, this "Thief of Bagdad," which comes from the studio of Douglas Fairbanks, and in which the incomparable "Doug" takes the leading rôle. The mechanics of it are perfect in spite of the fact that several effects which have never heretofore been attempted by the movie impresarios are used. The success of their workmen and their plans is proved by the fact that even to one accustomed to seeing all the so-called super movies, and educated to all their mechanical tricks, this Bagdad picture holds the illusion. It is as fine a piece of work as a precision observatory clock. Usually, to those accustomed to watch for the mechanics of a production they all turn out to be more or less poorly done mechanically. Not so here.

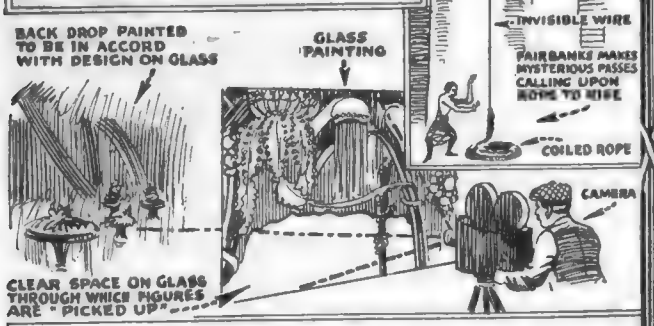
There were some kinky problems facing the technical director when the plans to film this fantasy were first unveiled in the Fairbanks studio. The cloak of invisibility, the flying carpet, the monster, the flying horse and the magic army were a few of them. This was only a part of the problem, however. There was an idol 300 feet high called for in the script, there were literal acres of castles and cities. Many of these obstacles were simply a matter of mass. Those depicted on these two pages, however, are the ones that demanded ingenuity and a

The magic rope—made of a witch's hair, so the caption says—which hangs suspended. Of course, the secret is a piano wire arranged as shown in the sketch at the right. The wire is attached in the center of the rope about two feet from the end. While "Doug" is hanging on the rope which is suspended in the air, seemingly without any support except its own magical powers, he twists the upper end down thus heightening the illusion greatly. The rope is made to rise or fall by saying a magical formula over it.



The Cloak of Invisibility plays an important part in the picture. The set is covered with black velvet and the characters, with the exception of their feet, as shown, are covered also and photographed. The cover is then taken off and the set is photographed with the camera in the same position as before without the actors. This second exposure is taken on the same film as that of the first one with the characters' feet showing. Thus it seems to the on-looker that the invisible cloak hides them from view.

PROPERTY MAN WHO PULLS UP ROPE AND FASTENS WIRE SUPPORT
LENS OF CAMERA ONLY TAKES IN UP TO THIS LINE
INVISIBLE WIRE
FAIRBANKS MAKES MYSTERIOUS PASSES CALLING UPON ROPE TO RISE
COILED ROPE


BACK DROP PAINTED TO BE IN ACCORD WITH DESIGN ON GLASS
GLASS PAINTING
CAMERA
CLEAR SPACE ON GLASS THROUGH WHICH FIGURES ARE "PICKED UP"

In his exploits "Doug" is led into the kingdoms under the sea. In one case he falls into the most wonderful crystal palace. Above, the view shows, how the scene was made. At the right is shown the scene itself. The scene was painted on a glass plate which was set in front of the camera. The size of the painted plants was so gauged as to appear in proper relation to the characters. The glass was set about four feet in front of the camera and the characters were seen through a clear portion.

Digitized by Google
UNIVERSITY OF CHICAGO

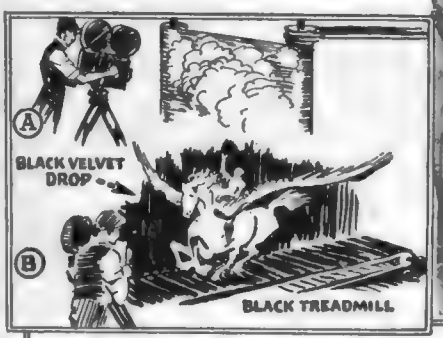
"The Thief of Bagdad"

OF HOLLYWOOD, CALIF.

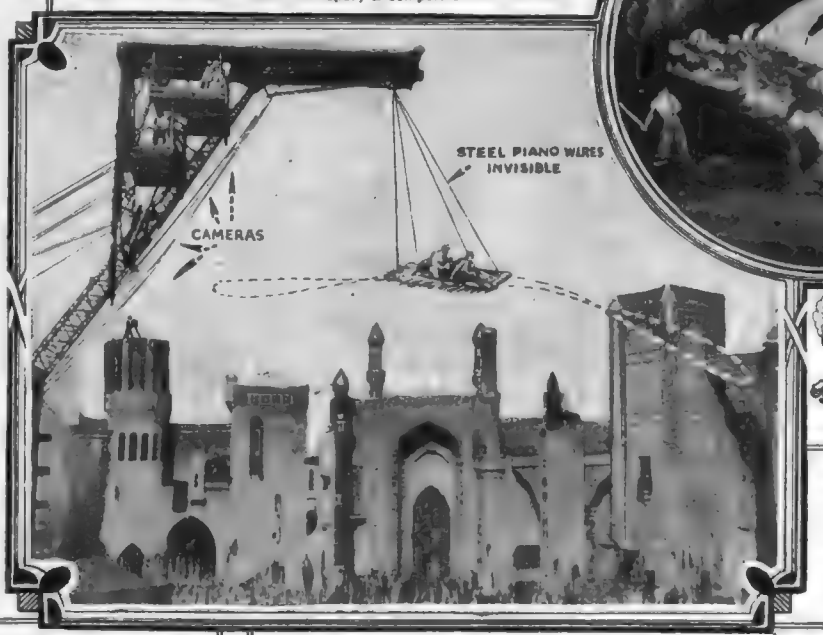
high skill in carrying out the solution once it was devised.

Whether it will be noted by a lay audience or not there is no means of ascertaining, but the fact remains that in every case where a solution to the seemingly miraculous feats was obvious, the director was at pains to show by means of some trick of the actors that the obvious solution was impossible, thereby heightening the illusion. One case of this sort is in connection with the magic rope which hangs suspended in the air with nothing except its magical qualities to hold it.

THE on-looker will immediately think—"Ha, it's easy, there's a wire." Immediately he says it, the illusion is gone and the picture loses its effectiveness. But, the mechanical director obviated his saying it. While "Doug" hangs onto the rope he bends the top of it over, showing that there is no wire attached—or making the audience think that there isn't one—for as a matter of truth there is and a good stout steel one, at that. But little tricks of that type give the picture its perfect finish. Where the mechanics would have been obvious the movie engineers have been careful to hide them. The simplicity of method used in obtaining some extremely gorgeous effects should lead to a lot of credit for the studio staff of designers.

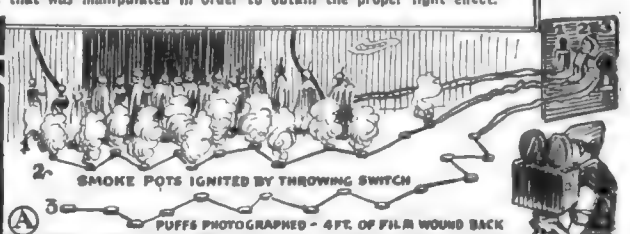


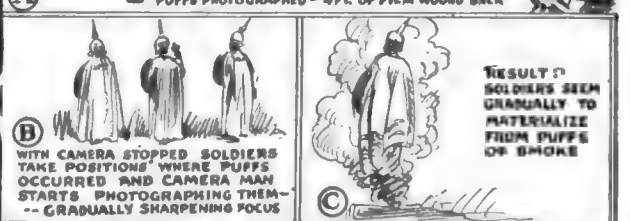
The Flying Horse upon which the Thief rides to the Citadel of the Moon is mystifying, to say the least, until the simplicity with which the scene was made, is explained. The horse and rider were taken against a black background and then the film was rewound and clouds painted on a moving canvas were taken. When developed, a composite view resulted.



There is a terrible monster made by harnessing horns to a crocodile, as shown, and taking an exposure at six feet. "Doug" is then taken on the same film at twenty feet. The distances gives the monstrous size.

The flying carpet comes from a window in the Caliph's castle and circles around over the housetops. This is the way it is made to work: The carpet on a wooden frame is suspended by piano wires from a crane. The cameras are placed on the boom and others on adjacent towers. By swinging the carpet and the cameras at the same time an effect of a wide swing is obtained—a much wider sweep than actually is made. The black canopy at the top of the crane is merely a sun shade that was manipulated in order to obtain the proper light effect.




B
WITH CAMERA STOPPED SOLDIERS TAKE POSITIONS WHERE PUFFS OCCURRED AND CAMERA MAN STARTS PHOTOGRAPHING THEM--GRADUALLY SHARPENING FOCUS
RESULT? SOLDIERS SEEM GRADUALLY TO MATERIALIZE FROM PUFFS OF SMOKE
C

A magic chest full of the most wonderful seeds is obtained in the Citadel of the Moon. In fact, with the aid of these seeds one has only to wish and cast a few of them on the ground and behold—In this case it is an army. Each handful of seeds causes a little puff of smoke out of which soldiers materialize. The sketch explains the trick. Electricity sets off the smoke pots. The camera stops and the soldiers step into the smoke. The camera starts again, slightly out of focus. It is brought gradually into sharpness making the soldiers seem to materialize.

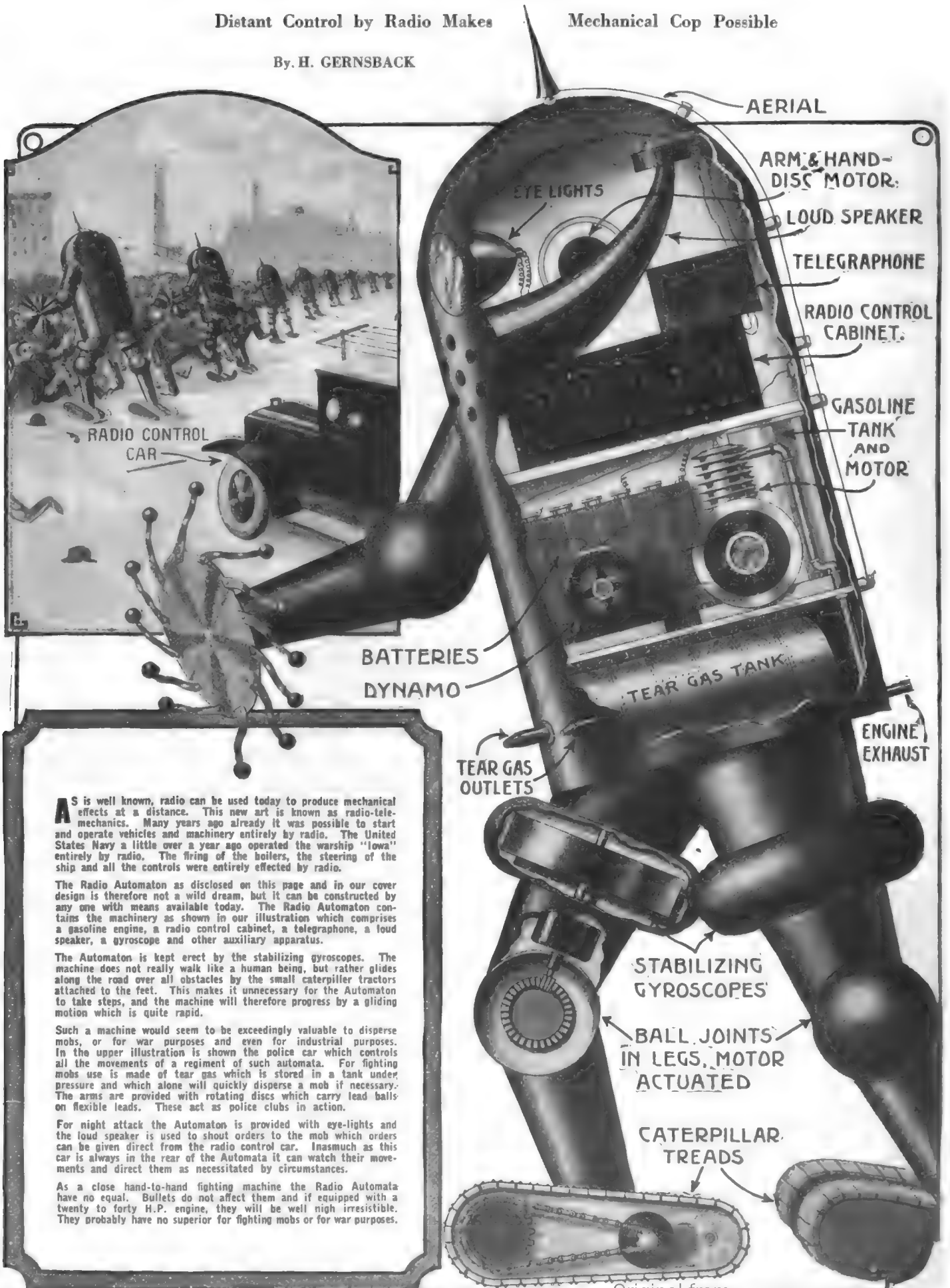
© 1924 BY SCIENCE AND INVENTION

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Radio Police Automaton

Distant Control by Radio Makes Mechanical Cop Possible

By. H. GERNSBACK



AS is well known, radio can be used today to produce mechanical effects at a distance. This new art is known as radio-telemechanics. Many years ago already it was possible to start and operate vehicles and machinery entirely by radio. The United States Navy a little over a year ago operated the warship "Iowa" entirely by radio. The firing of the boilers, the steering of the ship and all the controls were entirely effected by radio.

The Radio Automaton as disclosed on this page and in our cover design is therefore not a wild dream, but it can be constructed by any one with means available today. The Radio Automaton contains the machinery as shown in our illustration which comprises a gasoline engine, a radio control cabinet, a telegraphone, a loud speaker, a gyroscope and other auxiliary apparatus.

The Automaton is kept erect by the stabilizing gyroscopes. The machine does not really walk like a human being, but rather glides along the road over all obstacles by the small caterpiller tractors attached to the feet. This makes it unnecessary for the Automaton to take steps, and the machine will therefore progress by a gliding motion which is quite rapid.

Such a machine would seem to be exceedingly valuable to disperse mobs, or for war purposes and even for industrial purposes. In the upper illustration is shown the police car which controls all the movements of a regiment of such automata. For fighting mobs use is made of tear gas which is stored in a tank under pressure and which alone will quickly disperse a mob if necessary. The arms are provided with rotating discs which carry lead balls on flexible leads. These act as police clubs in action.

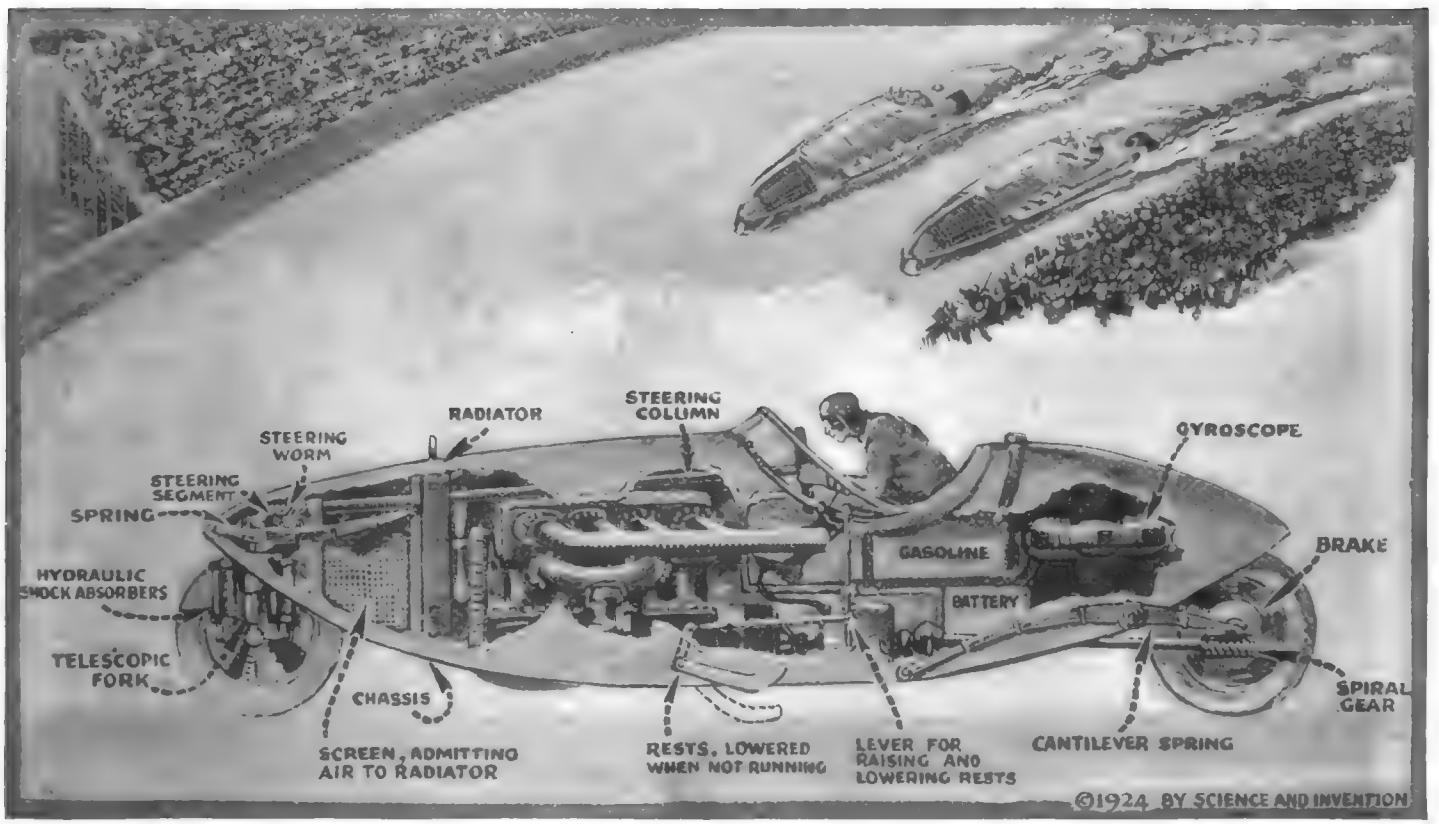
For night attack the Automaton is provided with eye-lights and the loud speaker is used to shout orders to the mob which orders can be given direct from the radio control car. Inasmuch as this car is always in the rear of the Automata it can watch their movements and direct them as necessitated by circumstances.

As a close hand-to-hand fighting machine the Radio Automata have no equal. Bullets do not affect them and if equipped with a twenty to forty H.P. engine, they will be well nigh irresistible. They probably have no superior for fighting mobs or for war purposes.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Gyroscope Racing Car

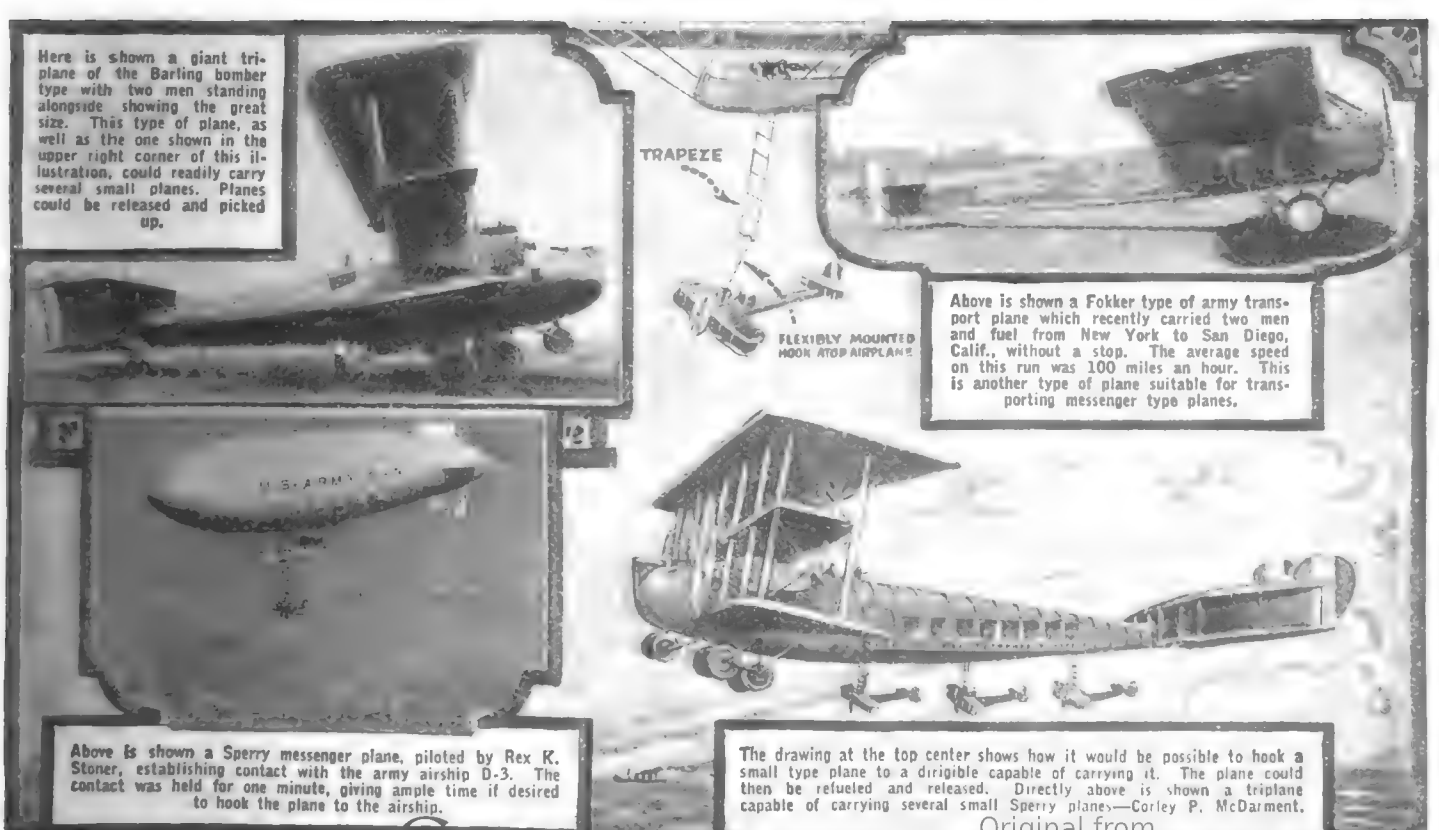
Two-Wheel Contact with Ground Increases Racing Speed



No matter how fast racing cars are designed to go, there is always a demand for more and more speed. This demand must be met and in order to do so those engineers who devote their entire time to the racing game have hit upon the idea of constructing a two-wheel automobile. This was suggested by the fact that motorcycles can travel at the rate of 100 miles an hour, while cars with three or more times the power only average about 116 miles an hour. However, in order to maintain the heavy engine of an automobile and the other correspondingly large parts in equilibrium it is necessary to provide a gyroscope in order to produce stability. Such a vehicle is illustrated above and we may soon see it tearing around the track at a speed of 175 miles an hour or more.

—Clarence A. Snyder.

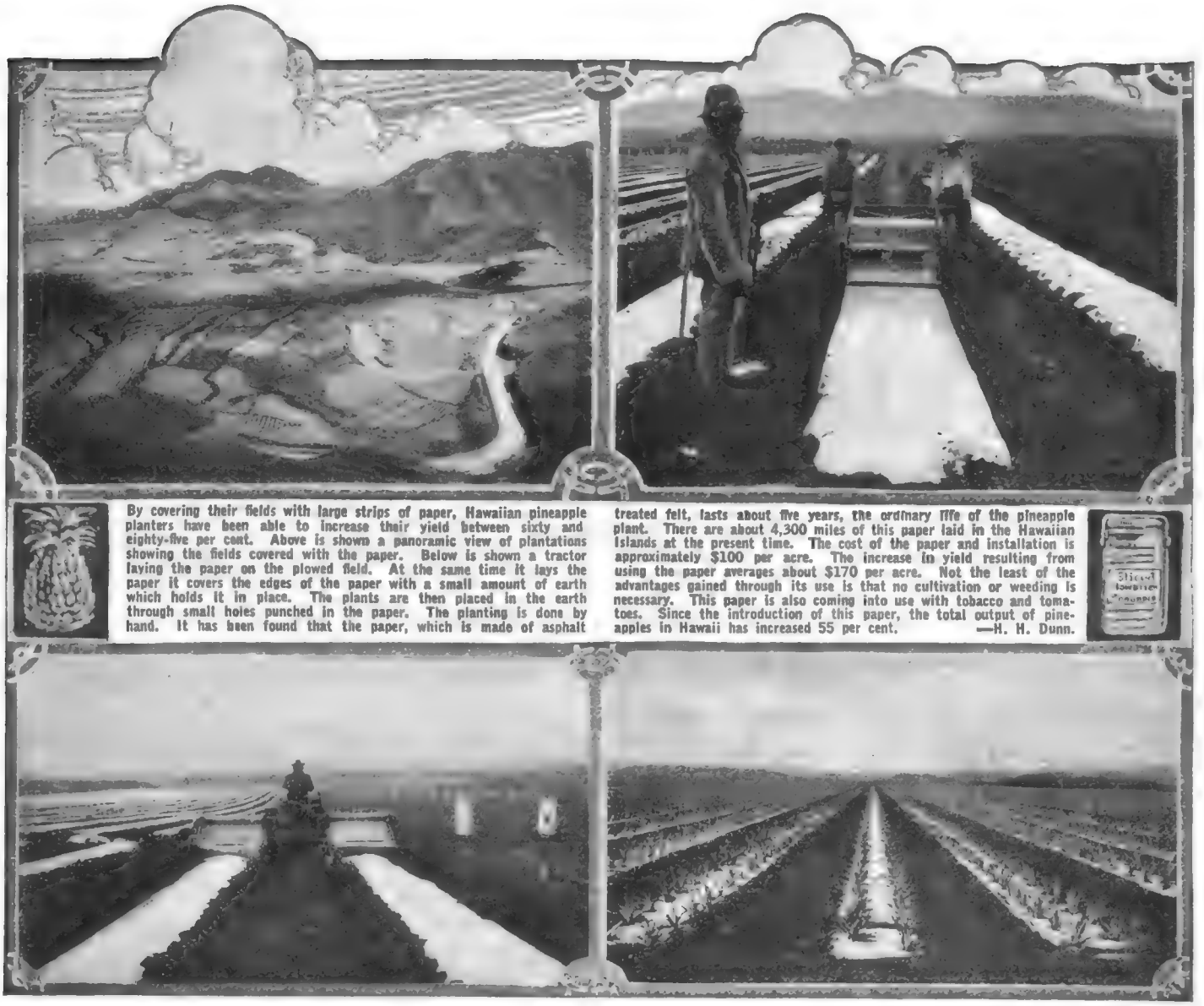
Airplane Makes Contact With Balloon


Here is shown a giant triplane of the Barling bomber type with two men standing alongside showing the great size. This type of plane, as well as the one shown in the upper right corner of this illustration, could readily carry several small planes. Planes could be released and picked up.
TRAPEZE
FLEXIBLY MOUNTED HOOK ATOP AIRPLANE
Above is shown a Fokker type of army transport plane which recently carried two men and fuel from New York to San Diego, Calif., without a stop. The average speed on this run was 100 miles an hour. This is another type of plane suitable for transporting messenger type planes.
Above is shown a Sperry messenger plane, piloted by Rex K. Stoner, establishing contact with the army airship D-3. The contact was held for one minute, giving ample time if desired to hook the plane to the airship.
The drawing at the top center shows how it would be possible to hook a small type plane to a dirigible capable of carrying it. The plane could then be refueled and released. Directly above is shown a triplane capable of carrying several small Sperry planes.—Corley P. McDarment.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

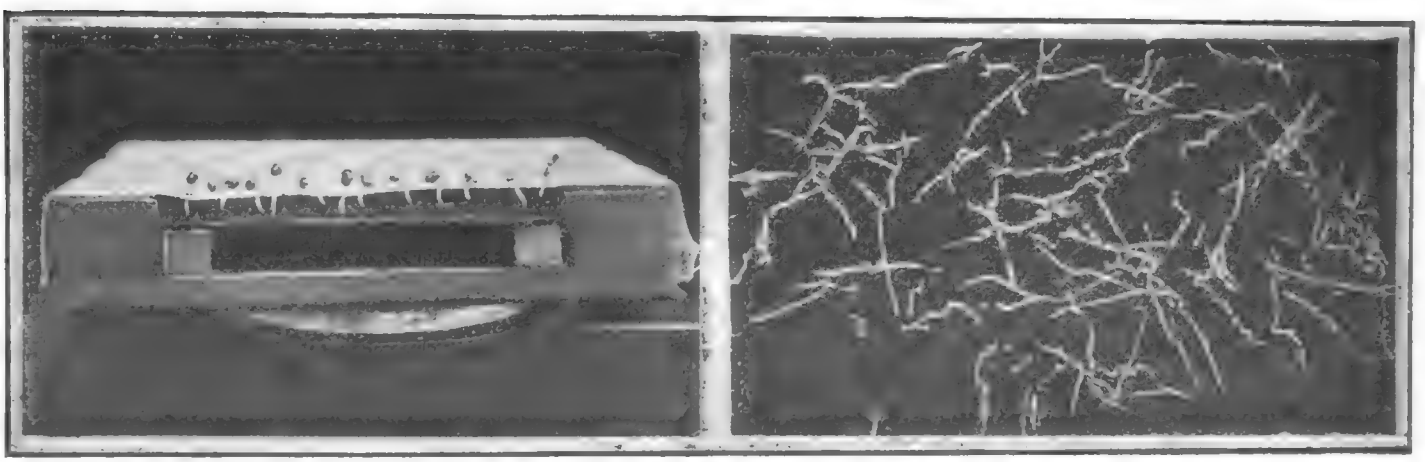
Paper on Fields Increase Yield

New Cultivation Method Does Away With Weeding



By covering their fields with large strips of paper, Hawaiian pineapple planters have been able to increase their yield between sixty and eighty-five per cent. Above is shown a panoramic view of plantations showing the fields covered with the paper. Below is shown a tractor laying the paper on the plowed field. At the same time it lays the paper it covers the edges of the paper with a small amount of earth which holds it in place. The plants are then placed in the earth through small holes punched in the paper. The planting is done by hand. It has been found that the paper, which is made of asphalt treated felt, lasts about five years, the ordinary life of the pineapple plant. There are about 4,300 miles of this paper laid in the Hawaiian Islands at the present time. The cost of the paper and installation is approximately $100 per acre. The increase in yield resulting from using the paper averages about $170 per acre. Not the least of the advantages gained through its use is that no cultivation or weeding is necessary. This paper is also coming into use with tobacco and tomatoes. Since the introduction of this paper, the total output of pineapples in Hawaii has increased 55 per cent. —H. H. Dunn.

THE SIGNATURE OF SEEDLINGS



The roots of young plants are constantly moving about, and are so healthy in their operations that their movements may be recorded. A method for setting down their amblings is shown above. A piece of cloth is stretched tightly across two blocks and kept damp. The seeds are laid on top and allowed to sprout. Beneath is placed a piece of smoked glass which the roots strike after growing down through the cloth. That they are constantly moving about while they are lengthening, may easily be seen by the designs made on the smoked glass. This ability to move about allows the plant to select the path of least resistance in stony or lumpy soil. —Leonard Bastin.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Beauty Culture of Tomorrow

How Science Will Work Where Nature Sometimes Fails

BY DOROTHY GERNSBACK

IN the rush and hurry of modern life many times Nature's processes are encroached upon, making it necessary for science to step in and make good Nature's default. A number of ways devised by beauty scientists to care for the neglect of Nature are shown here. In the first illustration above is a method of giving the face a Turkish bath in order to bring out the best of the complexion for those who may not live in the open. In the second illustration is shown a mechanical method for removing blue veins that have become discolored by the use of an electric massaging needle. Then at 3 we have the well-known permanent waving apparatus which is simply a method of winding the hair, immersed in a secret oil, about a cardboard form, inserting the form in an electric heater and baking the hair. At 4 there is illustrated a method by which a Parisian beauty expert removes wrinkles by livening the skin of the face through the agency of an electric needle. And at 5 is the latest in toilette labor saving devices—an electric tooth brush. It is simply a small brush revolved by a motor. A tanned skin is a healthy one, but it is impossible to obtain a tan in winter, so here at 6 is the latest method of obtaining one artificially by means of a powerful light.

BELOW we have some of the beauty adjuncts of the boudoir of tomorrow. The first illustrated at 7 is an electric manicuring device which will shape the nails, remove the cuticle, give a dull or bright finish, all by means of a mechanical arrangement. The shaping of the nails is done by means of rotating rollers. A rotating buffer, to which is applied a polishing compound, gives a finish. At 8 is—oh-hum—a bow-leg straightener, which consists of a stiff aluminum frame adjustable to the shape of the calf and lower leg, but yet held rigidly straight. An electric eyebrow tweezer which does its work painlessly and permanently is illustrated at 9. An electric current kills the root of the hair. At 10 is a perfume spray, pocket size, which may be used to perfume the breath, etc. The ability of certain electric rays to grow hair is more or less established. This is applied at 11 in an electric eyelash grower. For permanently dying the hair, there will be an electric needle which injects the pigment beneath the scalp, coloring the hair from the roots, thus obviating all trace of artificiality. This is shown at 12. The nose shaper is already known in a different form. At 13 a split casing fits rigidly over the nose forcing it into shape by tightening a few screws.

Google
Original from UNIVERSITY OF CHICAGO

The INFINITE VISION

BY CHARLES C. WINN

A telescope of such power as to enable us to view the moon's molecules, forms the center around which this story revolves. Scientists found many strange things on our satellite and on the planets.

The last two tubes again faded into darkness, and the view receded to the original ten-thousand foot scene. With an almost imperceptible movement of his hand upon a lever, he brought the landscape flashing across the screen in a glorious panorama.

"I TELL you, gentlemen, this is a pretty pass of affairs. Here all the other branches of science are open to practically an unlimited development, while Astronomy is nearly strapped because of one thing—that we have apparently reached the limit of development of the telescope, as evidenced by these plates here. Something must be done. Can't any of you suggest anything?" and the speaker paused and glared around the table.

It was a meeting of the *International Astronomical Society*, gathered to discuss the results of the trial of the giant forty foot mercury reflector telescope which had recently been completed in the great Holton Observatory, situated high up among the South American Andes.

Evidently the results had been none too satisfactory, as evidenced by the grave and thoughtful expressions of the company. Holton, the chairman, with his none too good ordinary humor, was fast working up to a literal tirade of rage.

"Possibly zee mercury reflector might be satisfactorily eemproved," mildly suggested Flambeau, the noted Frenchman, in response to Holton's heated demand.

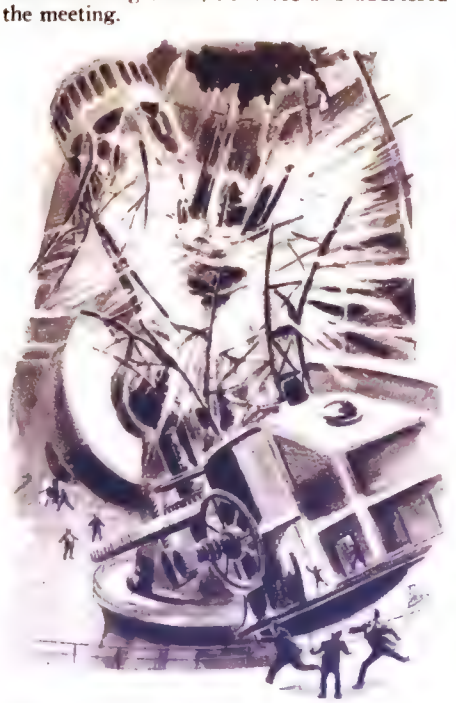
That individual gave a snort of disgust, and his wiry red hair fairly bristled, as he spat out his withering reply.

"What, that d—— thing! Why that thing is perfected as far as it lies within the power of mortal man to do it. But look at this plate—magnified enough, but as far as detail goes——! Looks like a striped pancake to me. Vibrationless action, H——! You can't entirely eliminate vibration in any machine. And look what microscopic ripples did in this case. Yes, I'd like to see you do anything with that crazy thing. And if you are fools enough to try it, after spending a million dollars with these results, why I absolutely refuse to have anything to do with it. I quit."

An uneasy silence followed this outburst. Not a man was present but who realized that, in spite of his eccentricities, Henry F. Holton was the greatest astronomical authority of the day. Consequently, no one had the temerity to oppose his views.

All through this stormy session, a tall dark man of about thirty-five sat patiently listening to the discourse. Glenn Faxworthy was, in all probability, the greatest scientific genius present at the meeting that day. Not only was he proficient in Astronomy, but to an even greater degree in Physics and Chemistry. He had disclosed some remarkable things in his day, this quiet forceful man. Curiously enough, however, he had chosen to keep them to himself, biding the day when their revelation might be doubly effective.

Finally when the tenseness of the silence was becoming acute, he arose and addressed the meeting.



With a sudden lurch, the thing on the roof had fallen completely to the perpendicular. There was a second frightful din as it rent asunder all within its path, ripping out the very vitals of the delicate apparatus that gave it life! Then it grew dark.

"Gentlemen," he said, "Put a million dollars available at my hands and I will build you a telescope which will reveal the molecules of the rocks of the moon."

THE PREPARATION

A cold moon was rising over the snow-capped summits of the Andes Range. Upon one of the highest peaks stood the gigantic Holton Observatory, situated in the most favorable location of the world for making observations.

On the steps of the huge concrete building two men stood in earnest conversation. One of them was short and red-haired, with bright blue eyes that snapped belligerently behind thick horn-rimmed spectacles. His companion, tall and dark, had about him an indefinable atmosphere of quiet force and dignity.

For ten years these men had been engaged in intensive labor, the one preparing the huge structure for the reception of the delicate apparatus which his companion was laboring to perfect in a great laboratory far off in the States.

Six months ago he had arrived with it. From that time, with the assistance of a small crew of men, they had worked almost night and day installing it. Only that day had they made the final adjustments which rendered it capable of the mighty function it was to perform.

For some moments the two stood, silently regarding the great looming bulk which contained all their hopes. Then the tall dark man, raising his eyes, glanced at a great red star, which shone threateningly, unblinkingly in the zenith. He spoke shortly to his companion, and together the two entered the structure.

Two hours later they emerged, their faces transfigured with the light of a great revelation. What they saw that night only ten others have seen, from that day until this.

* * *

Twenty-four hours later the same men entered the building again. This time, however, they were accompanied by ten others, the greatest scientists of three continents.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Harlton, the English physicist, was there; Coron, the American chemist; Flambeau, the Frenchman, together with the heads of the four greatest observatories of the world, and others.

In the center of the room to which they were conducted, stood the massive mercury reflector, the subject of the torrid discussion of ten years before. But now it was strangely altered. No longer was it set immovably upon giant pivots, pointing unalterably, to a single spot in the heavens. Now it was fitted into a ponderous equatorial mounting, as delicately balanced as a precision chronometer. And its shining surface no longer needed rapid rotation to maintain its perfect parabolical form. The liquid metal was now set as rigid as steel. The master hand of the physicist had given it eternal solidity.

The party gazed in silence and wonder for a moment at the colossal creation of the human mind, and then turned and followed their guides up a long flight of stairs to a large room under the center of the huge dome.

It was a marvelous room, filled with an intricate complication of ingenious apparatus. Upon one side was banked series after series of vacuum tubes, mounted upon long panels of shining bakelite. Another wall was completely hidden by a huge switchboard, studded with a seemingly endless array of switches, control knobs, rheostats and levers.

In the center of the floor was mounted a shining silver screen about six feet square. Looking down upon it, the men could see the reflection of a strange piece of apparatus pointing directly down upon it, from the ceiling above.

For some moments the party stood gazing in mute wonderment at their surroundings. Then Faxworthy, as you may have guessed the identity of the tall dark man, spoke to them in his ever quiet level voice.

And from its top an enormous ray of unearthly luminescence shot sharply out into space! Again the last two bulbs flashed into light.

THE TELESCOPE

"Gentlemen," he said, "here before you lies the results of ten years of intensive labor by Mr. Holton and myself—the product of the million dollars with which you so kindly provided me. Whether you have received an ample return on your investment, only you can judge tonight. However, I do not expect you to be disappointed."

Then walking over to the board, he threw one of the switches. Instantly the low hum of an electric motor was heard from below.

"The power comes from a good-sized hydro-electric plant down on the other side of the mountain," he explained. "It was Holton's idea." And, he added, smiling gently, "Holton was an invaluable factor in the construction of the mounting for the reflector and other requisite auxiliary apparatus. If we are successful tonight, he shares all honors."

Then, turning to the board again, he moved a lever which brought the aperture of the huge dome around to the east. Another switch, and upon the very apex of the dome, mounted upon a small steel tower, a weird piece of apparatus, much resembling a huge X-ray tube sprang into life, unseen to the watchers below. Then, guided by the master hand, it swung upward until it pointed full upon the rising moon.

Faxworthy spoke again. "Gentlemen, I now have the reflector in the room below trained upon the moon. Watch the screen closely."

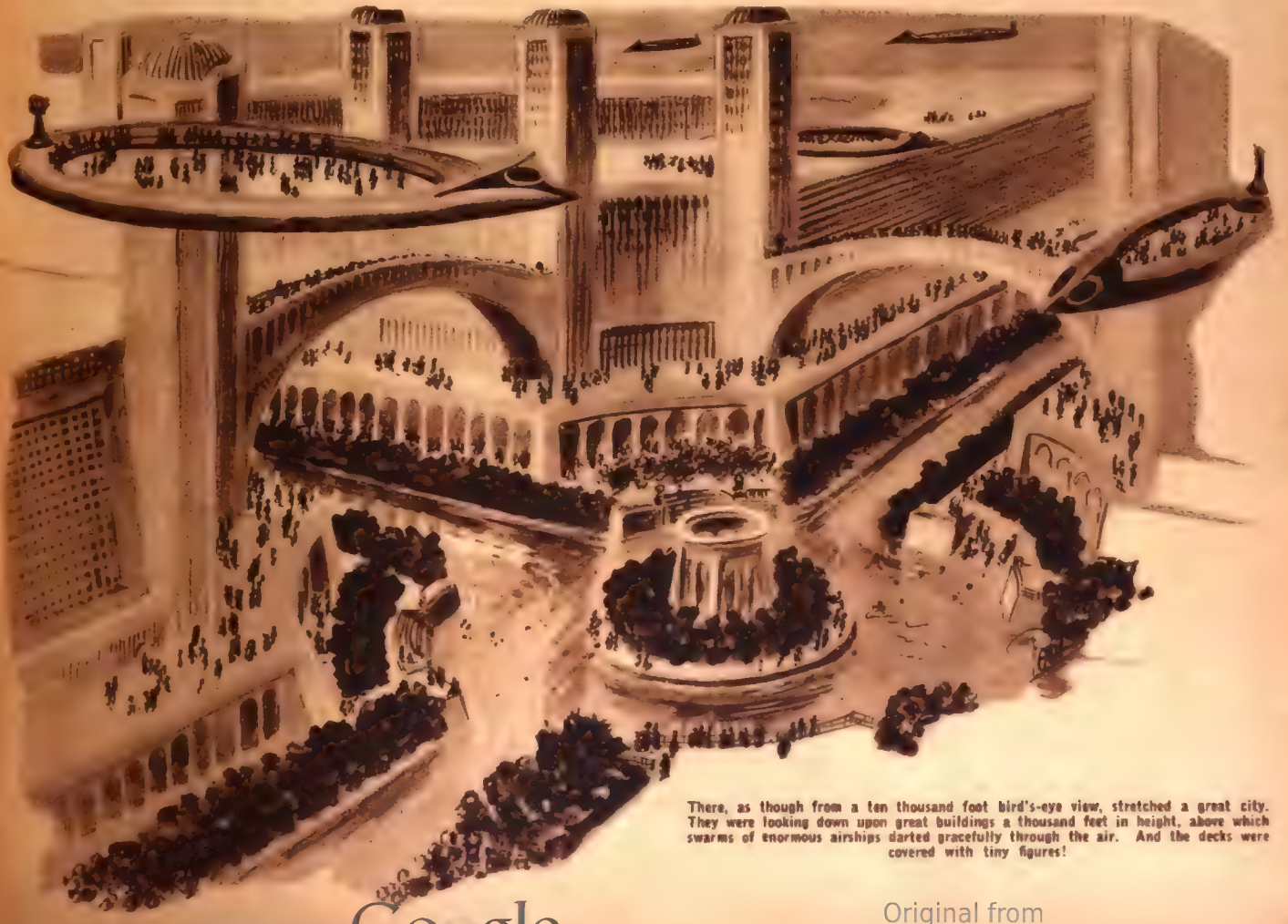
He threw another switch. A low hum came from above, which speedily grew in pitch to a piercing whine, which soon became inaudible to the listeners below.

He turned a control knob, and two of the vacuum tubes lighted up. Simultaneously a strange beam of luminescence shot downward from the apparatus above.

Gazing down upon the screen the men saw an object that riveted their immediate attention. There, as though floating upon the silvery depths, was a beautifully detailed image of the moon.

Rapturously the group looked upon it. Then Faxworthy, with a dexterous twist of his wrist, snapped two more of the tubes into the circuit. The first image faded away, and was replaced by one, filling the entire

(*Continued on page* 70)



There, as though from a ten thousand foot bird's-eye view, stretched a great city. They were looking down upon great buildings a thousand feet in height, above which swarms of enormous airships darted gracefully through the air. And the decks were covered with tiny figures!

Google
Original from
UNIVERSITY OF CHICAGO

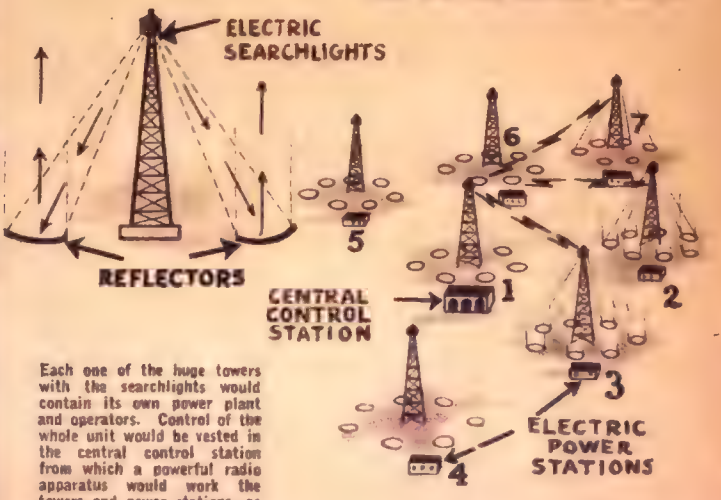
More Interstellar Communication

BY CHEVALIER DE TERRAIL

It is always interesting, the possibility of communicating with a sister planet. Here is the latest method—and seemingly one of the most logical and least complicated which has been put forward for some time. This system contemplates the use of huge chalk saucers as reflectors upon which are flashed the beams of powerful searchlights. Towers are erected at long intervals surrounded by a number of these saucers. By means of this system of illumination, a figure of a man or an animal is worked out over a large area. The completed figure may have a height running into the hundreds of miles, at least large enough to be visible from another planet. By making this figure movable through the agency of flashing the lights on and off, a definite sign could be given to another planet showing that life exists on the earth and that communication is desired. This would no doubt elicit an answer if the inhabitants of the other planet—presumably Mars—have reached a state of civilization at all similar to our own.

An idea of how the complete figure would be formed with the dots of light, is illustrated in these sketches. The idea is very similar to that used in half-tone printing, where a great number of dots placed closely together are used to give a solid image. The method of moving the arms or legs or head of the figure depicted, is obvious, since it follows the same principle as that employed in present day animated electric signs. This principle is shown in the small illustration to the left.

An idea of the image formed on the earth's face by this scheme is given in the above illustration. The huge form of the man or animal would stand out in distinct contrast, at night, against the black background of the earth.



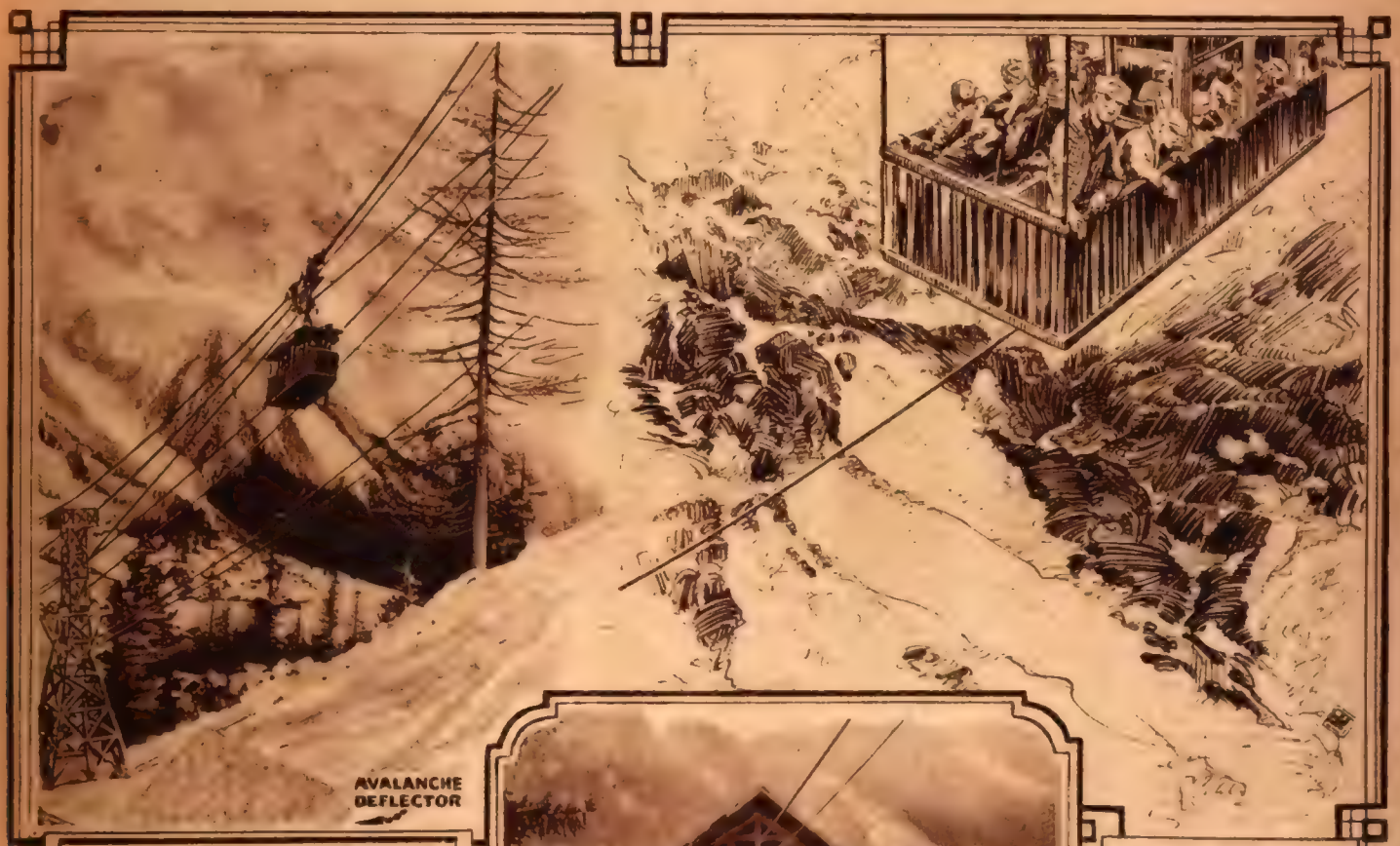
Each one of the huge towers with the searchlights would contain its own power plant and operators. Control of the whole unit would be vested in the central control station from which a powerful radio apparatus would work the towers and power stations, as shown in the illustration here.

Google
Original from
UNIVERSITY OF CALIFORNIA

World's Highest Cable Railway

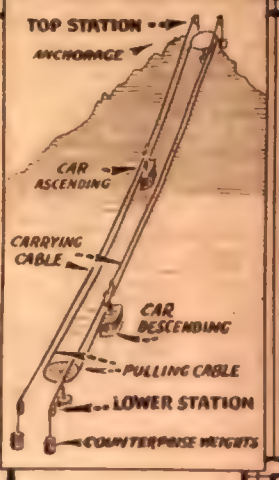
Highest Point of Aerial Railroad Almost Equals Mt. Blanc

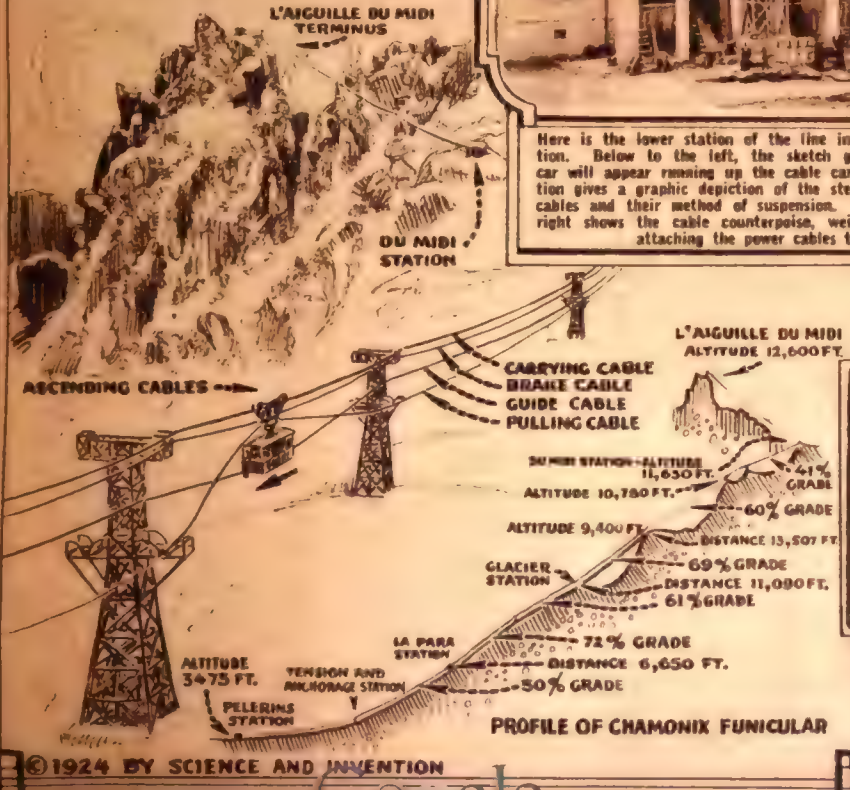
BY H. WINFIELD SECOR



A cable railway rising over one of the roughest sections of the Alps to a height of 12,600 feet above sea level is in construction at Mt. L'Aiguille Du Midi, Switzerland. Its purpose is to carry tourists from the railway station at the foot of the mountain to a winter resort built at the upper terminals of the railway. At this resort it will be possible to carry on winter sports in July. The railway is a dual one.

Here is the lower station of the line in the process of construction. Below to the left, the sketch gives an idea of how the car will appear running up the cable carriers. Also, the illustration gives a graphic depiction of the steel tower supports for the cables and their method of suspension. The small sketch at the right shows the cable counterpoise, weights and the method of attaching the power cables to the motor.





Here is shown a section of the aerial railway already completed graphically illustrating how the route passes over extremely rough country. No little difficulty was encountered in transporting the various materials.

©1924 BY SCIENCE AND INVENTION

Digitized by Google
Original from UNIVERSITY OF CHICAGO

A marvelous clock dating from the time of Caesar which would probably cost $350,000 were it constructed today. The Roman day was divided into twelve equal periods as was the Roman night, making the hour of every day of a different length. This clock compensated for all these changes.

Marvelous Roman Clock

BY CHARLES BEECHER BUNNELL

THE subject of our painting is "Watching the Clock." The Clock of our illustration is a Greek Water Clock, invented 280 years before Christ, by Otesibus of Alexandria, and described by his son, Hiero of Alexandria in four books written about that time. Just after Caesar's death Vitruvius wrote a treatise on Clocks. The Vitruvius Clock as it now stands—registers nearly the "sixth hour" of Roman time --which would be nearly quarter to Twelve (meridian) June the 16th. The Romans divided daylight into twelve equal parts—and darkness into twelve equal parts—which they termed hours. In Summer that made the Roman hours 75 minutes long and in winter they were 45 minutes long. Summer nights the hours were 45 minutes—so that when the minutes of their 24 hours were added together—they were precisely the same as ours. A clock of our illustration owing to the fine almost indiscernible Mosaic Work, would cost to-day at least $350,000 and require a long time to make.

This method of keeping time really amounted to a daylight saving plan which was accomplished by a variable tubular dial which divided daylight (sun-up to sunset) into twelve parts, termed hours. In winter each hour was approximately 45 minutes in length, from December the hour increased its minutes until June, when it became approximately 75 minutes long. Then from June it decreased in reverse to December. In all these variations the sum of the variable day hours and night hours were equal in minutes to our 24-Hour Day.

The Roman time followed the Sun coinciding astronomically, physically, mentally and conveniently so there was real harmony throughout the whole empire. Dinner time was always in the middle of the day—and the length of the hours corresponded to men's strength at the season of the year. Thus there was no confusion or profanity through the misnomer we call the present day-light saving time movement.

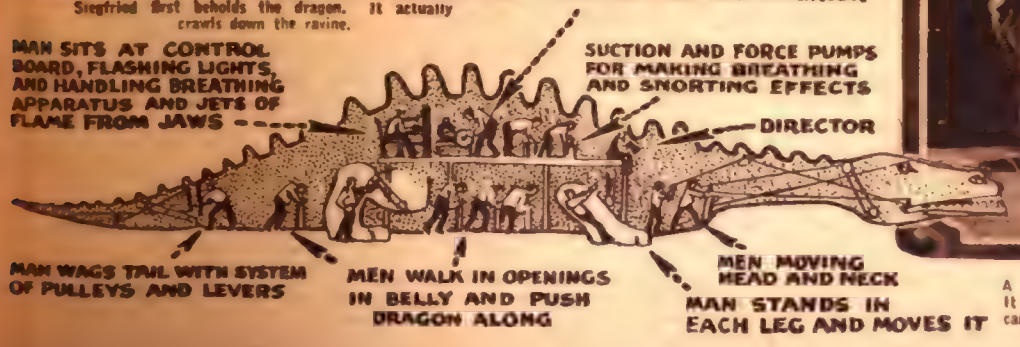
Digitized by Google
Original from UNIVERSITY OF CHICAGO

Dragon Reproduced for German Film

By DR. ALBERT NEUBURGER

Siegfried first beholds the dragon. It actually crawls down the ravine.

POSSIBLY the most beautiful as well as the most well-known legend of the German people is the Nibelungen, and one of the most harrowing episodes in the legend is Siegfried's fight with the dragon. Wagner immortalized the legend with his series of operas, "Das Nibelungenlied." A German film company recently brought out a movie production of the myth complete in every detail. Of course the climax of the film comes when Siegfried slays the dragon. The dragon itself is a masterpiece of stage mechanics. In the photograph at the top of the page is shown the dragon at the spring snorting flames of fire and steam in an attempt to slay Siegfried. The other photographs illustrate different episodes of the fight. The diagrammatic sketch at the bottom shows the way seventeen men were used to operate the huge dragon built on a steel framework and covered with canvas. It was operated entirely by human power. The eyes flashed, the paws smote the stones and the nostrils gave forth venomous streams of fire and steam. Note how four men operated the feet and how men with systems of pulleys and cables switched the tail and the head


HAND OPERATED DYNAMO FOR LIGHTING EYES AND INTERIOR
MAN SITS AT CONTROL BOARD, FLASHING LIGHTS, AND HANDLING BREATHING APPARATUS AND JETS OF FLAME FROM JAWS
SUCTION AND FORCE PUMPS FOR MAKING BREATHING AND SNORTING EFFECTS
DIRECTOR
MAN WAGS TAIL WITH SYSTEM OF PULLEYS AND LEVERS
MEN WALK IN OPENINGS IN BELLY AND PUSH DRAGON ALONG
MEN MOVING HEAD AND NECK
MAN STANDS IN EACH LEG AND MOVES IT

A close-up view of the dragon after having a drink. It is so realistic and so perfectly operated, that water can be plainly seen dripping from the animal's mouth.

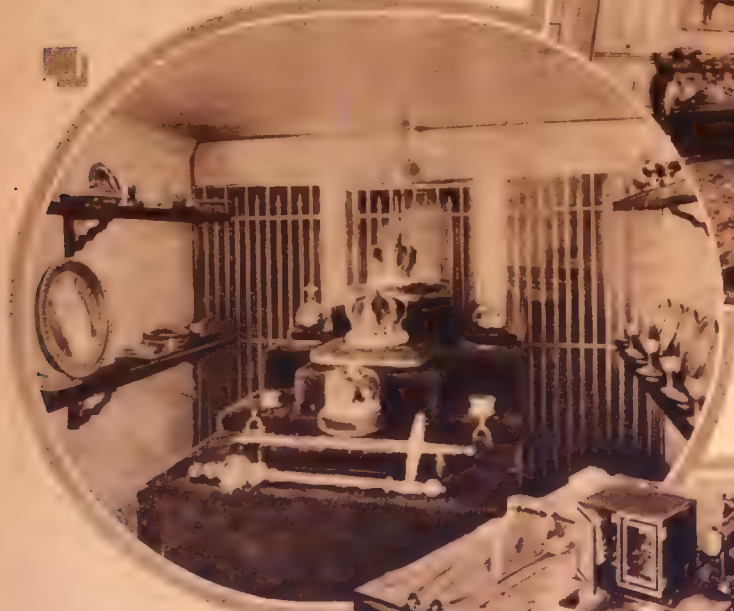
Google Original from UNIVERSITY OF CHICAGO

The Queen's Doll House

In order that our present day methods of building may not be lost to future generations, Sir Edward Lutyens, an Englishman, has designed and built this model house containing all the best in architecture, mechanical conveniences and interior decoration that can be found today. The complete model measures eight feet six inches long, five feet deep, and about eight feet high. There is a tiny garden, as well as a complete garage with small models of automobiles. Above is shown an interior view of the Queen's bedroom. The ceiling is only twenty-two inches high, yet the gray silk hangings, the walnut furniture, and even the blue enameled toilet set, as well as a small photograph of the King, are exact replicas.

In the above view the exterior of the model house is shown.

The dining room which is twenty-eight inches high, is complete even to quarter inch high salt shakers.



The house is complete even to a strong room which holds the crown and sceptre, as well as the plate. These are made of real gold studded with extremely small jewels, and are excellent replicas of the original, although only about one-tenth their size. Different firms throughout England furnished the various bits of work and materials that went into the house. Prominent artists did the interior decorating. The bedroom is by Glyn Philpot

The mechanical details throughout the house are complete. At the left is shown the motors operating the elevators, and the miniature electric plant and the refrigerating unit. There are electric lights in every room, complete mechanical equipment for the kitchen, in fact every modern convenience which is embodied in all the newer large homes. After the exhibition this house will find its way to a museum where it will remain as a record to all future generations.

Google Original from UNIVERSITY OF CHICAGO

A Hotel of Pompeii

Some Adjuncts of the Ancient Hostelry

BY CHARLES BEECHER BUNNELL

1

Above is shown two wine jars of ancient Pompeii. The name of the vintage was inscribed with a needle on the front of the jar in ink in a space provided.

THAT some of the most perfect bronze and copper work of the world was done in ancient Pompeii, has long been known. Some of their work used in inns and hotels, is illustrated on this page. From these bits it will be plainly seen that even in those times, workers in metal were masters of their craft. Not only in metals but even glass and in some degree in paint were these ancients our equals. Many of the forms of the utensils shown on this page differ materially from their present day forms, but the similarity will be at once obvious and the development of the present day style from those that obtained in the thriving days of the ancient Roman city can be traced. Each of the pieces of apparatus illustrated on this page found some definite use in the ancient household. In some cases novel ideas were employed that might be used even today.

2

Cooling by evaporation was used in Pompeii, as shown by the above illustration, where the jars to be cooled were set in porous clay baskets filled with water.

3

Above is shown a street corner traffic bell, many of which were used in the ancient Roman city. They were rung by travelers at night.

7

They drank their morning coffee in those days out of a glass cup and saucer, one of which is shown in the above illustration.

4

In the yard of the inns was usually suspended a gong similar to the one above. The late traveler announced his arrival by ringing it.

5

A bronze comb with its chain suspension. This toilet article was richly inlaid with designs in silver, making it highly decorative.

6

Seemingly the Pompeiians had to have their three minute eggs just as we do today. Above is shown the dish in which they cooked them, each egg having a separate compartment.

8

Solid bronze bridles were in vogue among the aristocratic equestrians of Pompeii, as shown by the above bridle which was excavated—like all the other utensils shown on this page—by historians working on the location of the buried city.

9

Women guests of the hotel were supplied with a nail file similar to the one shown above. Like the comb it was made of bronze with inlay work on its back.

10

11

Above we have a bronze spur used by equestrians. At the right above is shown a beautiful lady's vanity box.

12

Here are three small effects showing that the ancients even as we moderns like entertainment. At the left is a "dead head" or complimentary theatre ticket. The center one is for orchestra, and the one at the right is for "nigger heaven."

14

16

A bronze razor—used only by noblemen—is shown at the left, while a thimble of the same material is shown above.

Gamblers in those days were as crooked as they are today. Witness the loaded dice shown above. Also there were anglers—witness the fish hook at the right

13

15

Above is a reproduction of a mural decoration found on the wall of a small Pompeian inn.

17

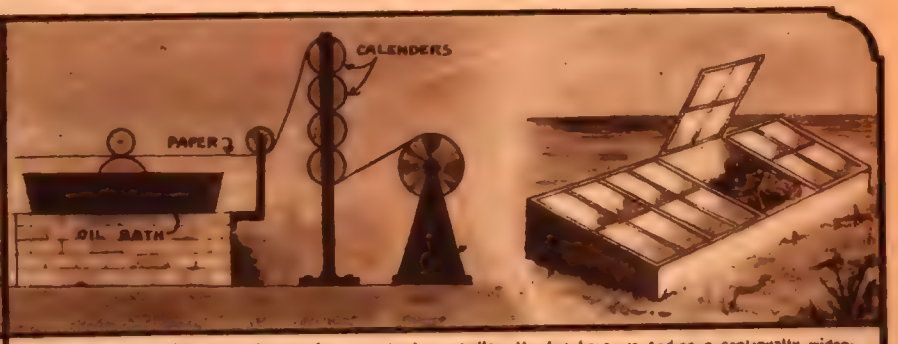
Digitized by Google
Original from UNIVERSITY OF CHICAGO

Odd Uses for Paper

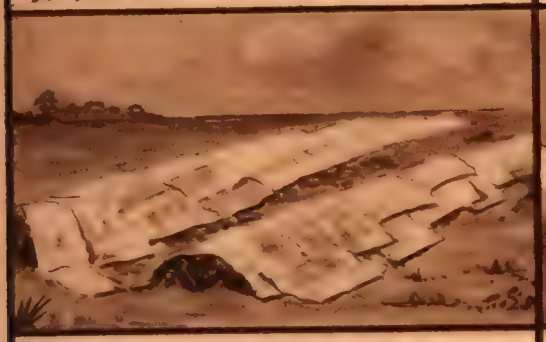
Special Treatments Make Paper Doubly Useful

BY ISMAR GINSBURG, B.Sc.

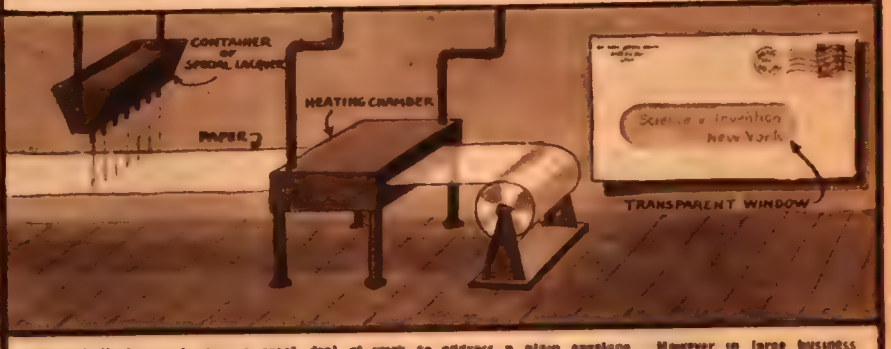
In the tobacco industry, particularly that part of it which is given over to raising cigar wrappers, where a perfect leaf is necessary, paper finds an extended use. Supports are placed at intervals along the rows of growing plants, and very thick heavy paper placed on top of the supports covering the plants. This prevents excessive evaporation of moisture and tends to grow perfect leaves. The same is the case with some plants.



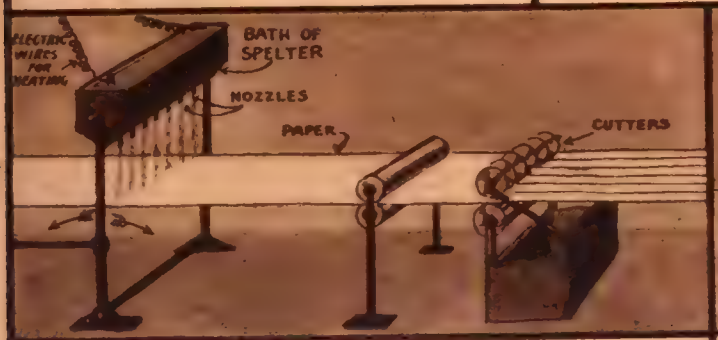
With a constantly increasing demand for early fresh vegetables, the hot house is finding a continually widening scope of use. There is a large percentage of breakage when glass is used as covering for the seedling plants. Here paper has found a new and growing use. A heavy grade of paper is given an oil bath, then pressed by being run through a series of calenders or rollers, and then used in the place of glass for covering the hot bed. It admits a finely diffused light which has been found to be of exceptional value in growing small sprouts from seeds. The paper covering is just as efficient from the point of maintaining the heat within the hot bed as the glass, and it has the very large advantage of being much cheaper.



Many of us are acquainted with the method shown above for preserving late plants from frost. On nights when there is danger of frost, the truck gardener gathers up all his old newspapers, carries them into his garden, and carefully covers the rows of plants, spreading them carefully over all of foliage or stems protruding from the ground. This prevents freezing.

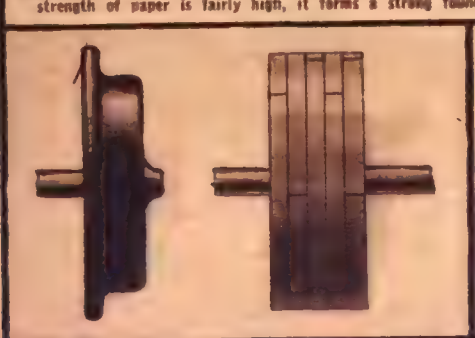


At first it does not seem a great deal of work to address a plain envelope. However in large business concerns where mail may run into the thousands of pieces per day the addressing of envelopes becomes quite a factor in the day's work and requires many extra people to perform it. Paper here finds a new realm of service which greatly decreases the overhead cost in large offices. If an ordinary white paper is treated with a lacquer, and quickly dried, it obtains a tough, transparent texture which may be placed on the inside of the ordinary envelope, in such a manner that the address on the letter itself may be used to address the envelope. Thus one address serves two purposes. Above is the process for making the paper transparent.



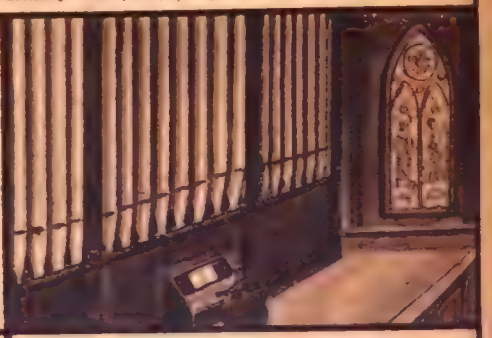
One of the most recent uses that has been found for paper is that devised by a German inventor in which it is used as the foundation for high tension electrical conductors. A tough grade of paper is passed under a vat of molten metal and the spelter is allowed to drip on the paper forming a thin coating. This is smoothed out by rollers after the metal has cooled. The paper is cut in strips and rolled in the form of wire. The process is clearly illustrated in the above drawing. Since the tensile strength of paper is fairly high, it forms a strong foundation for the conductor.

Who has not seen last year's circus posters glaring out almost in their original beauty in spite of a winter season subjecting them to all sorts of weather, and wondered why it is that the paper does not disintegrate and the ink flow off or be carried away by rain and snow. The secret lies in a varnishing process. After having been printed, the forms are passed between rollers, giving them a gelatine bath, after which they are carried to a second set of rollers, which covers both sides of the paper with a varnish, making it practically water-proof, and giving it its lasting quality



One of the latest uses to which paper is being put is that of car wheels, pulleys and gears, where a large number of gears are necessary, such as on printing presses, and other complicated machines, the noise is terrific at high speeds. If a paper gear is interposed between every two metal gears, the noise is materially reduced or eliminated, at no expense in efficiency.

Even in the manufacture of shoes, paper finds a very important niche. The foundation for supporting the shape of the toe is a pressed paper product. The same is the case with the counters and the heel support. Illustrations of these products are given above. There are huge plants doing nothing but building up the paper and pressing it into shape to supply the shoe industry.



In Milan, Italy, there is a pipe organ, all of the pipes of which are made of paper. Much care was needed in selecting the proper grades and building up the laminations that went into the pipes. The result, however, was well worth the work expended, since the tone of the organ is one of the best known. It has been in use for years and is still in good condition.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Fine Art in Glass Blowing

Illustrations of Expert Craftsmanship

Some of the most delicate artistic work known to modern annals of science comes from glass blowing. Although the art is an extremely old one—glass having been found even in very early times—it has not been until recent years that the art reached its present height. Above are given two illustrations showing what can be done in the manufacture of glass trinkets. To the right is an old-fashioned spinning wheel, while at the left is a yarn carder.

Above is shown a dish of flowers. The whole piece is made of glass including the flowers. More than seven different varieties of glass had to be used in making the parts; one kind being used for the stand and bowl; another type for the extremely delicate decorative effects; still other varieties for the different parts of the flowers. The coloring of the blooms shown is almost perfect. In order to gain the extremely natural effects, the artist had to observe the most minute care in the selection of the pieces and varieties of glass, which were used.

WHO has not seen the old glass blower at the County Fair pumping away at his foot bellows and carefully pulling his tiny strings of glass, blowing up his tube, putting a colored dot here or there, carefully shaping a leg or head, until he finally turns out a highly ornate figure, which he will sell? Above are shown some of the ordinary specimens that may be encountered at most any carnival. The other specimens on this page, however, are more or less pretentious and their kind is not liable to be seen coming from the hands of the ordinary glass blower. The secret of their success lies as much with the little flame and bellows which furnishes the heat for their work, as with their deft fingers and practiced eyes. At the right is shown Theodor Grömes from Lauscha in Saxon Meiningen at his work bench. The two extremely fine pieces of work shown at the top of this page are from his hands.

Digitized by Google
UNIVERSITY OF CHICAGO

Some New Mechanical Developments

Novel Inventions from All Corners of the World

Guests of the Trocadero Hotel, London, were surprised recently when banquet tables were decorated with peculiar vases made of ice. In the above illustration is shown a chef at the hotel chiselling one of the vases out of a block of ice with the aid of a red hot chisel.

At a recent scientific exhibit held at King's College, London, a new oxygen apparatus was exhibited by professors from the University. Through the aid of this apparatus, it will be possible for airmen or mountain climbers to pass the thirty thousand foot altitude mark with the utmost ease, so far as breathing is concerned. A complete unit of the apparatus, including connecting hose, generator and pressure gauges, is shown at the left.

Most teachers find it very difficult to give younger students a clear idea of the rotation of the earth, moon and sun. The above shown Tellurian will assist materially in this work. It is motor-driven and geared so as to give the proper relations of rotation. The lamp represents the sun. Phases of the moon are visible.

There is no little difficulty encountered many times in the cleaning of the sides of skyscrapers or making repairs in their walls, such as tuck pointing or replacing broken stones, or working up near the roof where no windows are available from which scaffolding may be erected. A French inventor has recently brought out the above illustrated apparatus which will enable the worker to pursue his work on the blankest wall of the highest skyscraper with perfect ease and with little danger to himself. It is suspended by a cable which extends from the roof. The carrying apparatus itself consists of a sort of glorified seat with safety appliances, and an arrangement for raising or lowering it at will. In the illustration above a worker is shown using the apparatus in making some repairs up near the roof of an old-time stone mansion in a position that would have been almost impossible without the aid of the apparatus.

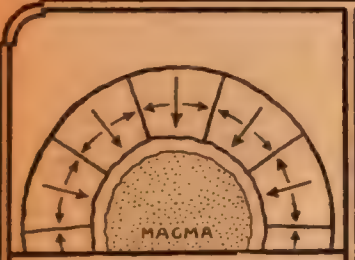
Roller skating is about to be revolutionized. In the future instead of the old four-wheeled skates with their attendant stiffness, there will be a new skate with only three wheels to the unit and built in such a way that the line at the bottom of the wheels where they bear on the floor is more or less in the form of a crescent similar in effect to ice skates. Mr. Miller-Metcalf is the inventor of this new skate and is shown in the above illustration exhibiting his novelty. It is understood that with this new type of skate most of the attendant difficulties of the older four-wheel type disappear entirely. The new ones are noiseless in operation and the floor upon which they are to be used needs no preparation as was the case with the older variety. The men's size weighs [illegible] and the women's only twelve and a half.

No little interest has been manifested by astronomers recently in the measurement of the heat of various celestial bodies. This has been made possible through several recent discoveries in the thermo-field, one of the most important of which is the vacuum thermo-couple which is extremely sensitive to heat. Above is shown Professor Coblentz of the U. S. Bureau of Standards, making an observation on the heat of certain stars with the aid of the vacuum thermo-couple. The couple itself consists of a very fine bi-metallic wire couple sealed in a vacuum.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

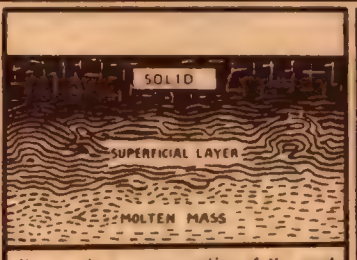
How Mountains Are Formed

Geologic Cycle Graphically Illustrated

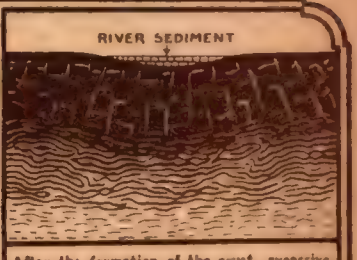


In the original form of the earth as magma or molten rock of a consistency of putty, radial pressure of the earth's gravitation was caused by the outer crust. This crust cooled and hardened. A cross section of the earth is shown above.

Masses of stone according to the theory of active vulcanism were forced out through the masses of soft magma, as shown in the above illustration. These great expulsions took place continually, ever increasing the thickness of the crust.

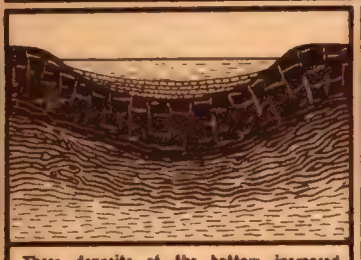


Here we have a cross section of the crust after it had reached a more or less stable state. The solid layer at the top rested on a superficial layer a little softer in consistency and the whole rested on the internal molten mass.

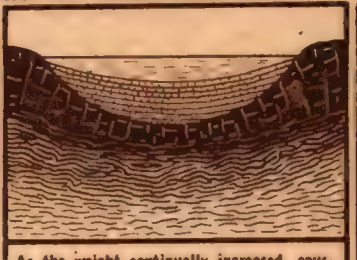


After the formation of the crust, excessive cooling caused shrinkage, allowing water to come in, which carried sediment in suspension with it, and deposited it in the lower depressions caused by the shrinkage, as in the above illustration.

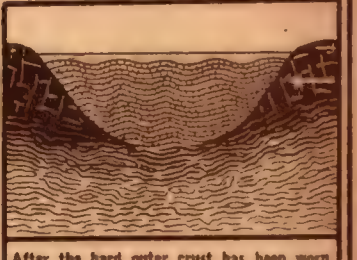
As the cooling continued the spot became lower and lower until the sea rushed in covering it entirely and depositing a greater amount of sediment foot by foot, tending to fill the spot to the level of the surrounding country.



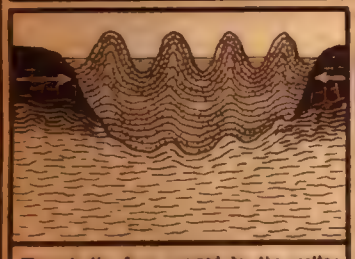
These deposits at the bottom increased foot by foot, and as they increased they added materially to the stress of the cooling, pressing the outer layer harder and harder upon the superficial layer and the molten interior mass.



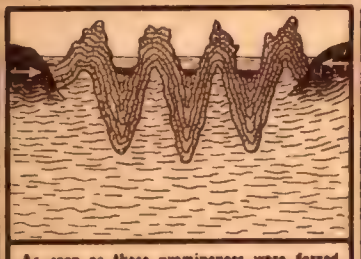
As the weight continually increased, causing the outer layer to extend deeper and deeper into the magma, the heat of the molten mass softened the under strata of the stiff crust, constantly decreasing its thickness and strength.



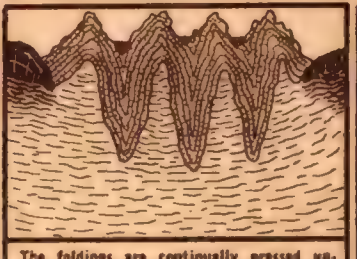
After the hard outer crust has been worn completely through, the magma in the interior finds the sedimental layers unprotected by the rock layer, and consequently begins to exert its force at this extremely weak point.



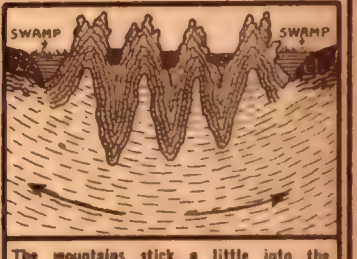
Through the force exerted by the molten interior which is in a constant state of flux, ridges or saddles were forced up through the sea, as shown in the above illustration, forming island groups as a result.



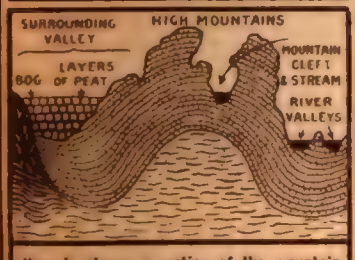
As soon as these prominences were forced up out of the sea, erosion began, tending to level off the protruding area. As shown above, erosion carried a part of the protruding peaks back into the valleys between them.



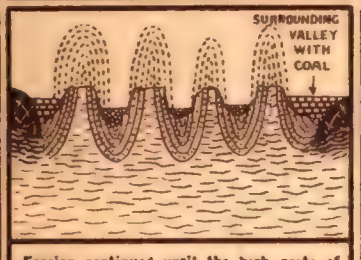
The foldings are continually pressed upward by the pressure from the interior. Erosion continues. As they are pressed upward the sea drains away, and with a continuation of the process the peaks are more and more like mountains.



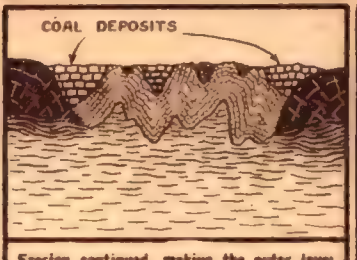
The mountains stick a little into the magma beneath. As they sink down into the soft mass beneath, the magma is forced to either side increasing the stress on adjacent portions, raising them higher than they were before.



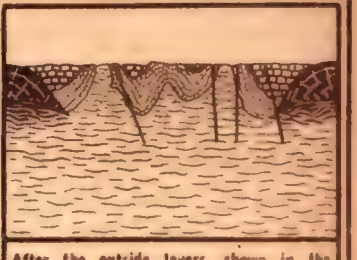
Here is shown a section of the mountain rock formation with peat deposits in the adjacent depressions. The magma rose up in places and solidified, forming primitive rock much as we have in the great Appalachian ridge of our eastern slope.



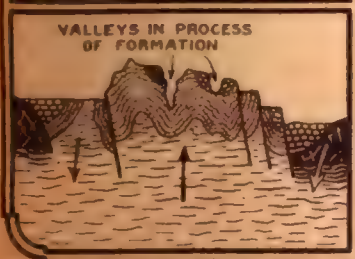
Erosion continued until the high parts of the mountain were entirely worn away. The pressure exerted by the continual deposit of erosional debris on the peat bogs pressed them into the form of what is known today as coal.



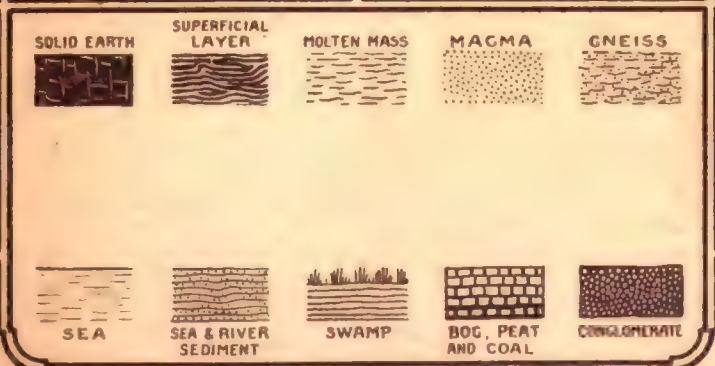
Erosion continued, making the outer layer now more or less conglomerate in its make-up, more and more level, leaving the extremely uneven cross section shown in the above diagram. This condition is prevalent in Germany.

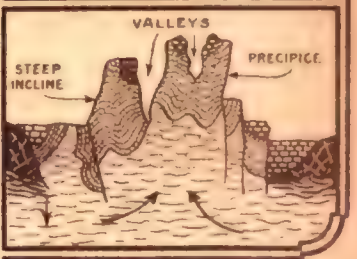


After the outside layers, shown in the previous cross section, had completely hardened, the work of expansion and contraction, resulting from constant changes in temperature through long ages, resulted in the fissures shown above.



The interior molten mass continues to exert its pressure even on the sinking exterior mass. In an attempt to equalize these two pressures, some sections are forced upward while others sink inward, leaving faults as shown.





The sinking mass presses the magma to one side, which lifts up the masses still remaining solid. These rise up like great pinnacles over their surroundings, and are now again cut up into abrupt valleys by water. —From Kosmos.

Google
Original from UNIVERSITY OF CHICAGO

Above is the star map for the month of May. If the chart is held over the head with the "Northern Horizon," north, at nine P. M., May first or eight P. M., May fifteenth the location of the stars in the heavens will coincide with their position on the map and may easily be found

The Heavens in May

By ISABEL M. LEWIS, M.A.
of the U. S. Naval Observatory

BY nine o'clock in the evening the first of May, or an hour earlier on the fifteenth, the Big Dipper will be found on the meridian, due north at its highest altitude above the pole and the best placed for observation. Cepheus and Cassiopeia are now in the position in which the Big Dipper was to be found six months ago below the pole and close to the northern horizon, so that these two groups are no longer to be seen to advantage. Leo, the leader of the more conspicuous of the spring groups, is now a little to the west of the meridian. Its distinctive sickle-shaped group of stars containing Regulus, its brightest star and one of the twenty brightest stars in the heavens, will aid us in locating this constellation.

In the days when the astrologers held sway over the masses and played on their ignorance and superstition Regulus was considered to be exclusively the star of royalty, wealth and fame being held to be the heritage of those born under its influence. Cor Leonis, The Heart of the Lion, was also a popular name for this star. Regulus is one of the least brilliant of the twenty leading stars. It is somewhat fainter than the standard star of first magnitude.

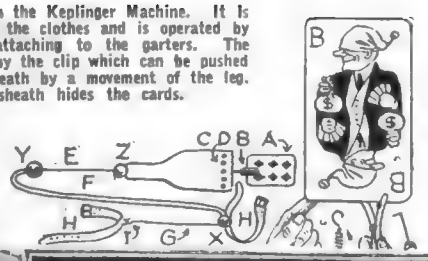
Denebola at the tip of the lion's tail is a star of the second magnitude, and with the first magnitude star Spica in Virgo and Arcturus in Böotes forms the large equal-sided triangle that is always associated with the early evening hours of spring. Spica, which is slightly brighter than Regulus, is bluish-white in color and is one of the hottest and most brilliant of the stars, its surface temperature being probably in the neighborhood of 10,000 degrees. Its brightness is estimated to be about 2,500 times that of the sun. Its distance from the earth is probably between 150 and 250 light years.

A little to the northeast of Spica we will find, in the position indicated on the chart, the planet Saturn which appears as a brilliant, yellowish, first magnitude star brighter

(Continued on page 107)

Digitized by Google
UNIVERSITY OF CHICAGO

Here is shown the Keplinger Machine. It is put on under the clothes and is operated by the strings attaching to the garters. The card is held by the clip which can be pushed out of the sheath by a movement of the leg. The sheath hides the cards.



The latest development in holdout machines is shown here. It fits under the trousers and works on the principle of the Keplinger device, cords being run to a garter about the leg. When the leg is moved the card holding device rises up.

A Gambler's Tricks Exposed

BY MARK MELLEN

The Man Who Fooled P. T. Barnum

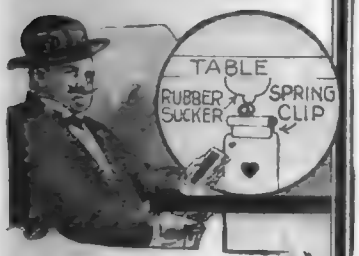
THIS month a number of "hold-out" schemes are shown. The value of this procedure to the professional gambler is obvious. In a poker game, with the use of one of the pieces of apparatus shown on this page it is possible for the expert to collect two or three aces by holding them out each time he is dealt one. He conceals his cheating by the methods shown. It is necessary that the apparatus used conceal the cards while they are being held out of the deal. This method is slow and does not always net the gambler a large return unless there are enough good hands around the table to make the betting good. It has the advantage, however, of being a comparatively safe method of beating the laws of chance. I show several more or less well-known—among the professionals, at least—devices and their system of operation. They are mostly extremely hard of detection. The surest check is a count of the deck. Those shown at the top of the page are the best.

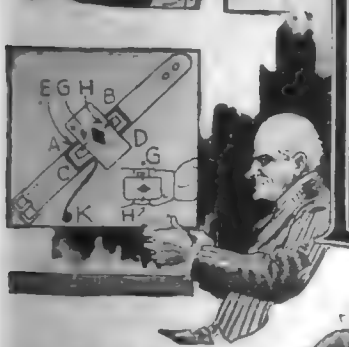
—Mark Mellen.

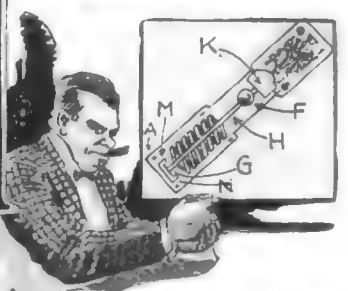
1 2

Below is shown a modification of the table bottom suction type of hold-out. The only difference between this piece of apparatus and that shown on the opposite side of the page is that this one is equipped with a bent wire to hold the cards instead of the spring clip.

Below is one of the more simple methods that may be used when the gambler is playing with a bunch of suckers with whom there is little danger of detection. The rubber bulb which is held beneath the table by suction has a spring clip which grips the cards being held out.

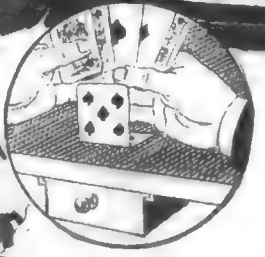




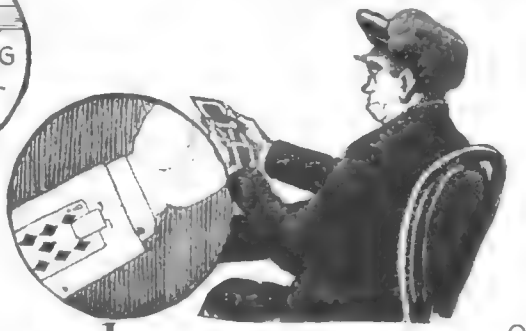


One of the old time methods—and one that still has its adherents among the elite—is that shown above. It consists of a pair of movable clips held in a brass slide which is fixed to a leather arm band. The device is put on under the coat. The clips come through the cloth of the coat. An extension lever opens and closes the clips to take the cards and hold them while the cheater is waiting. The lever is designated at K. The strap goes around the arm just enough above the wrist to keep it out of view of the other players.

One of the more elaborate pieces of apparatus to be installed in the sleeve is shown above. The Jacob's-ladder extension works by a spring which is controlled by the ball F. The gambler, by allowing his arm to rest heavily on the table presses the ball forcing the extension down into his hand. He then inserts the card in the clip provided and releases the pressure whereupon the spring exerts its action carrying the card within the lining of the sharp's coat sleeve.



In gambling houses one of the most prevalent forms of hold-out apparatus is the type shown above. The table, at first glance appears to be an ordinary poker table equipped with a chip slot at the banker's position. On examination, however, it turns out that the brass plate forming the chip slot is movable downward and is held in place most of the time by springs. The cheater simply places his cards to be held out on the plate and presses down. The cards are dropped out of sight into the hold-out. To bring them back he simply presses down on the plate and the springs do the rest.



Here is one of the most simple of the types of hold-out apparatus. It is nothing more than a shoemaker's awl with a piece of spring steel attached to it so that when the awl is stuck into the bottom of the table the spring will hold the cards between itself and the bottom of the table as shown. Right—another type of sleeve hold-out.

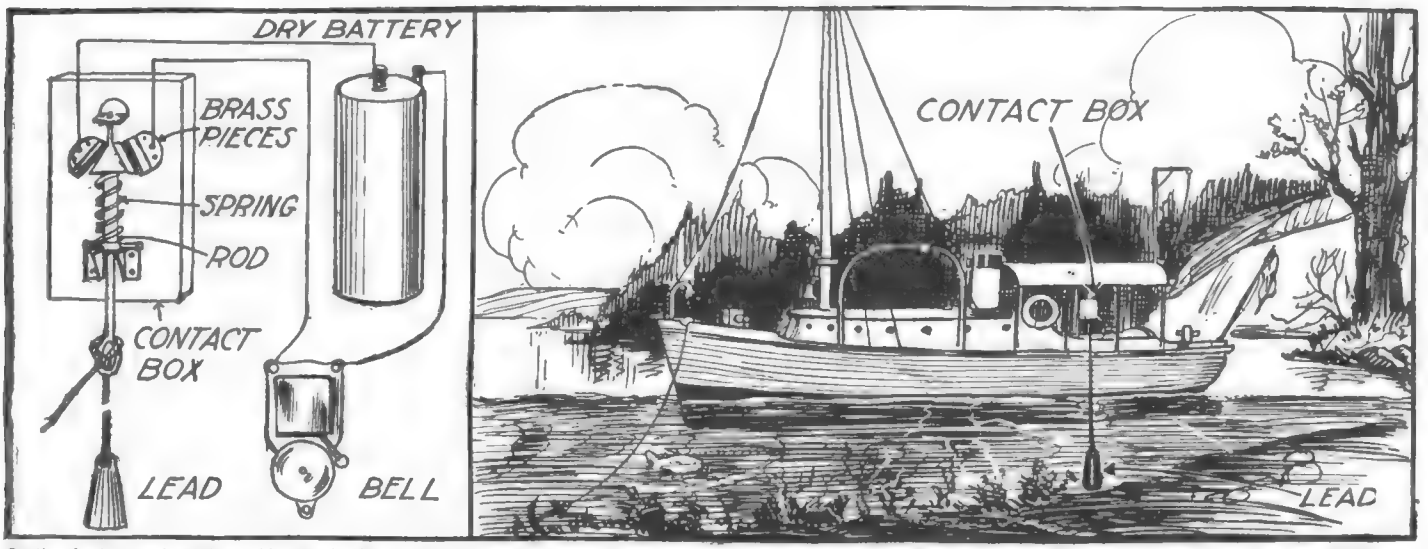
One of the simplest methods known is that of the palm hold-out. The only trouble with it is that the gambler using it must be a sleight-of-hand performer to operate successfully. It consists of a thin strip of celluloid inserted under a ring which holds the card between itself and the palm of the player's hand.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

CHEMICAL HOT WATER BOTTLE

The heat produced by the oxidation of iron filings is the heating element of this hot water bottle. The form of the bag is the same as that conventionally used except the bottle has a flap which covers the outlet. The mixture in the bag consists of iron filings and an ammonia salt which is added to hasten the heating process. It is only necessary to pour three ounces of cold water into the bag and then knead it for a few minutes in order to produce a temperature high enough for use medically.

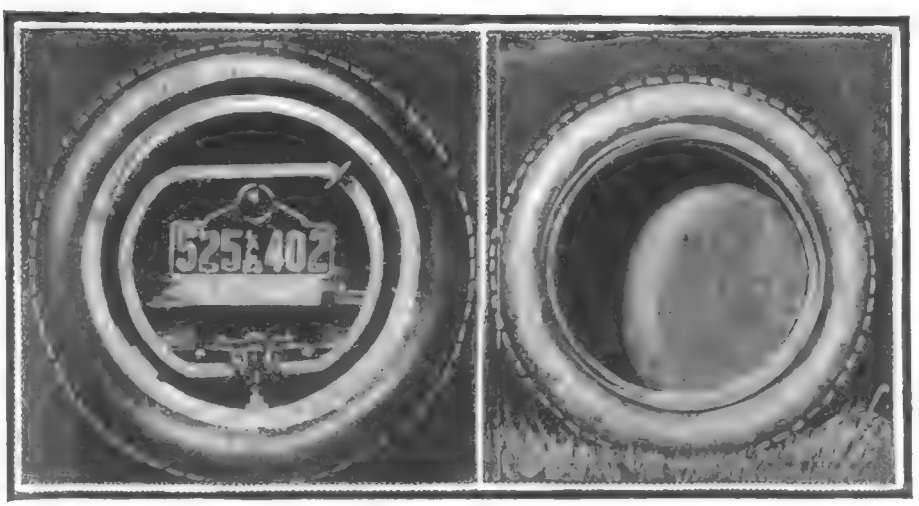
Electrical Watchman For Boats



By the simple expedient of attaching a pair of contact points to the lead-line of a motor boat the danger of the boat's running aground or being left high and dry by an out-going tide is forestalled. The arrangement for attaching this electrical watchman to the boat is shown in the above sketch. It also may be used while the boat is running in strange waters and is in danger of going aground. When the keel of the boat comes too close to the bottom of the stream, the lead-line is slackened and the contact (shown in the sketch to the left), is closed by the spring forcing it up against the two lugs, causing the alarm bell to ring.

—Carl Bjork.

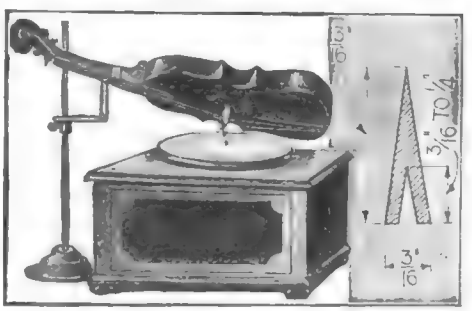
For Clean Tires



If tires are painted with a solution made of one-half pint of black stove enamel and a quarter of a pint of gasoline, they will at all times present a bright appearance. This is especially useful for application to spare tires.

—E. A. K. Hackett.

Violin Phonograph



A wonderfully full tone may be obtained from a phonograph by attaching a small hardwood wedge cut in the form shown above, to the bridge of a violin and allowing the wedge to act as the phonograph needle.

—La Nature.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

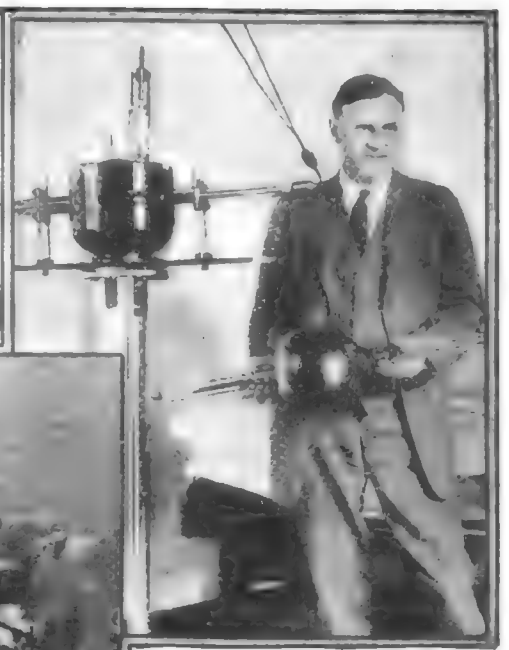
Some New Discoveries

New Advances in Automotive and Medical Fields

Above is a new method of removing hair invented by Dr. Jules M. Marton of New York. This is placed on the face in the form of a mask, while warm. It is allowed to cool and the hair, which is gripped in the mask is removed with the mask. X-rays are then applied to prevent the further growth of hair.

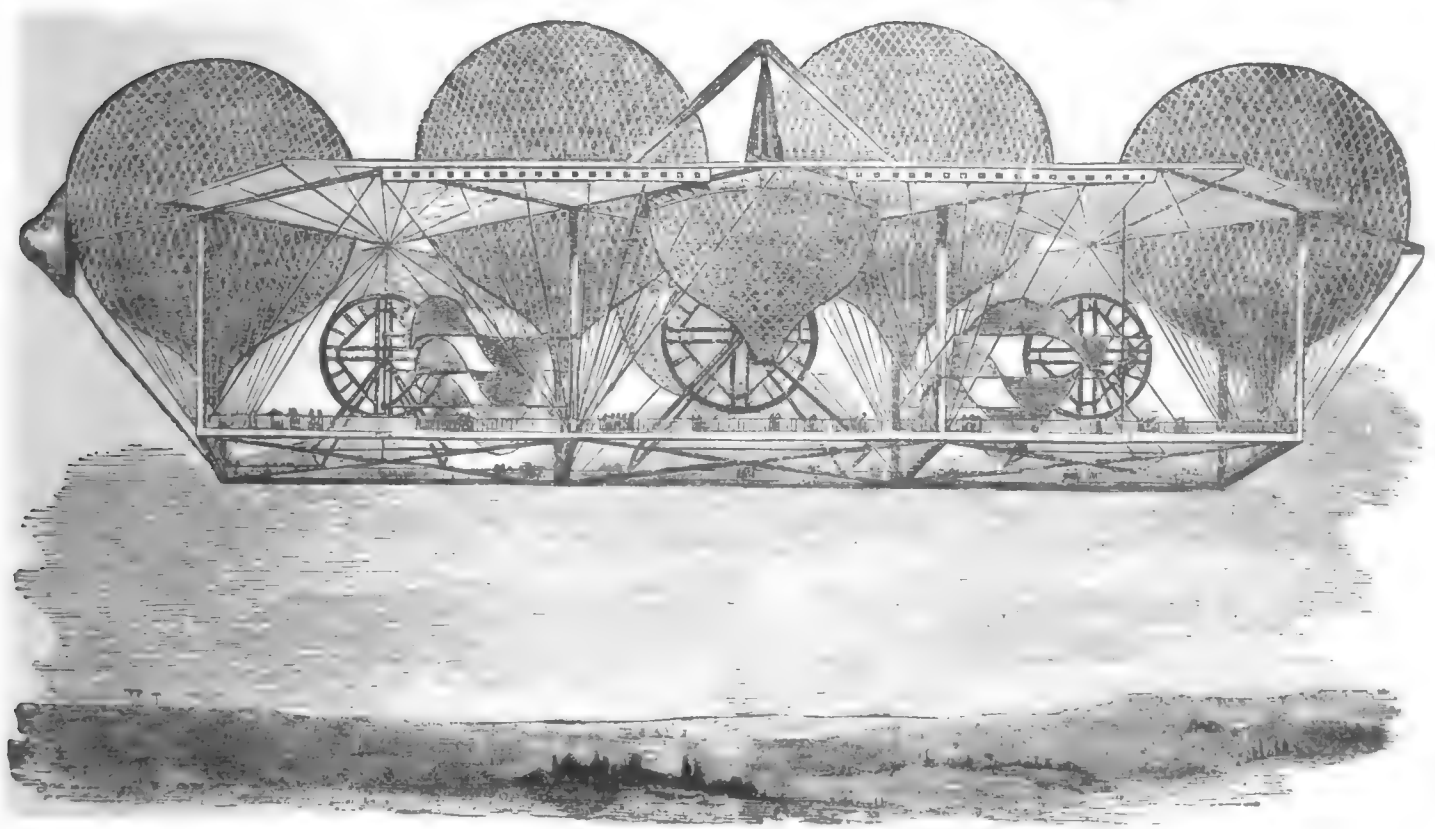
The automobile shown below is capable of turning in its own length becauses it steers from all four wheels. It can be made to negotiate roads entirely too rough for ordinary cars and will climb extremely steep hills. This new automobile is driven from all four wheels, the engine acting on all of them. A four-wheel brake accompanies and completes the improvement. The principle of steering all four wheels of an automobile is by no means new to residents of large communities, as trucks using this principle are very often employed by fire departments. Here, however, the steering is usually done by two men, whereas in the case of the automobile illustrated below, the wheels are connected together in such a manner that the turning of the steering wheel acts upon all four wheels. This feature, in connection with the four-wheel drive and the four-wheel braking system, reduces skidding to a very great extent and makes for much safer driving.

Photo © U. & U.



The above photo shows Dr. Francis C. Wood holding a new X-ray tube which is capable of giving out five or six times the power of the ordinary "modern" tube of today. This X-ray tube is to be used in the treatment of cancer. Dr. Wood is the Director of the Crocker Institute of Cancer Research of Columbia University.

Airship of Seventy Years Ago

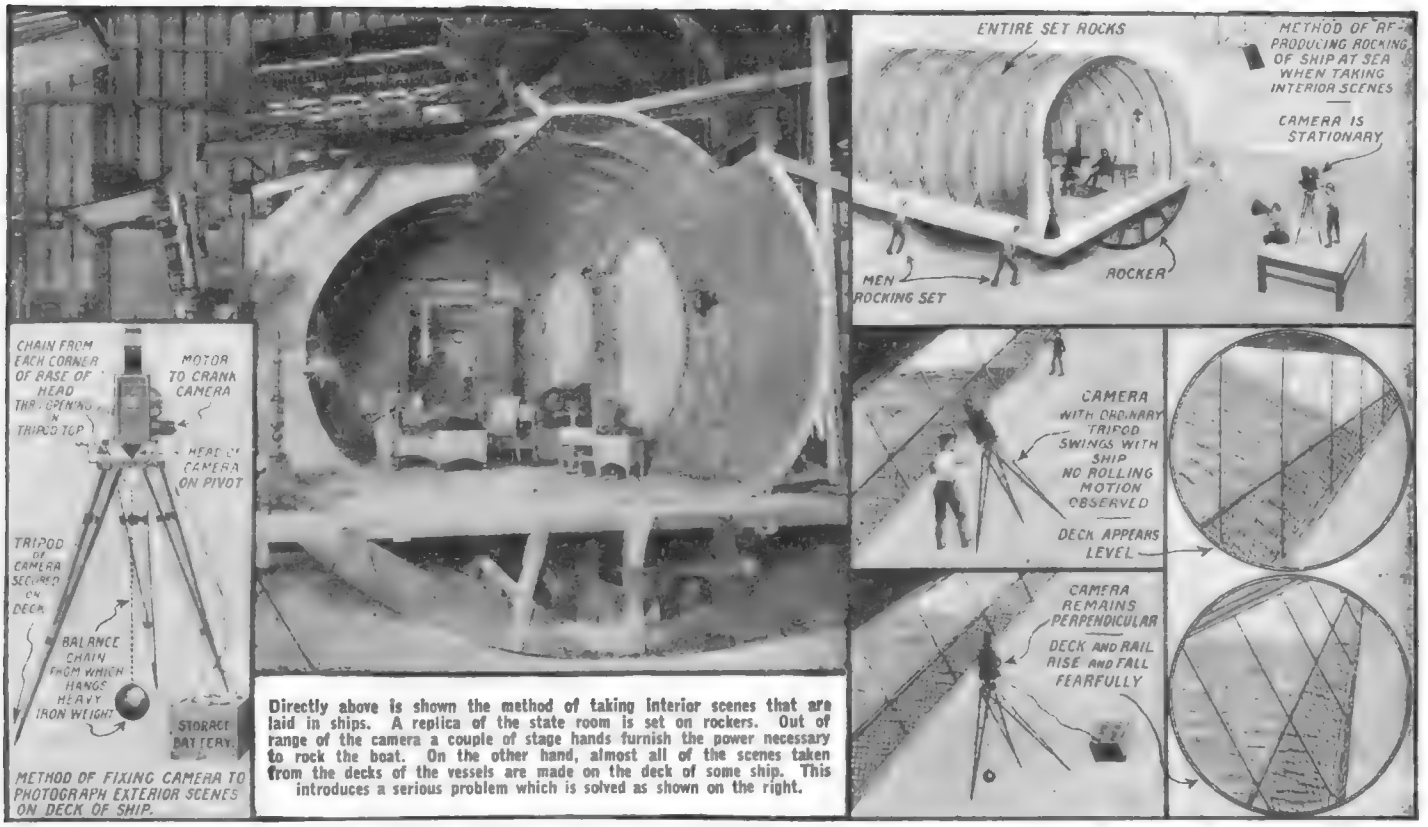


Above is a reproduction of a wood cut from "Gleason's Pictorial Drawing Room Companion," published at Boston, Mass., and which was inscribed "Saturday, Jan. 10th, 1852." It is called "Petin's Air Propeller." At this time Mr. Petin hoped to attain the long-desired power of rendering the balloon obedient to one's will. Doubt was expressed if the thing would be ultimately consummated. The editor of "Gleason's" then asked what became of the Hoboken flying machine. —John Foley, Reporter No. 4335.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Movie Kinks for Ship Scenes

METHODS USED BY PHOTOGRAPHERS TO GAIN REALISM


CHAIN FROM EACH CORNER OF BASE OF HEAD THRU OPENING IN TRIPOD TOP
MOTOR TO CRANK CAMERA
HEAD OF CAMERA ON PIVOT
TRIPOD OF CAMERA SECURED ON DECK
BALANCE CHAIN FROM WHICH HANGS HEAVY IRON WEIGHT
STORAGE BATTERY
METHOD OF FIXING CAMERA TO PHOTOGRAPH EXTERIOR SCENES ON DECK OF SHIP.
ENTIRE SET ROCKS
METHOD OF REPRODUCING ROCKING OF SHIP AT SEA WHEN TAKING INTERIOR SCENES
CAMERA IS STATIONARY
MEN ROCKING SET
ROCKER
CAMERA WITH ORDINARY TRIPOD SWINGS WITH SHIP NO ROLLING MOTION OBSERVED
DECK APPEARS LEVEL
CAMERA REMAINS PERPENDICULAR
DECK AND RAIL RISE AND FALL FEARFULLY

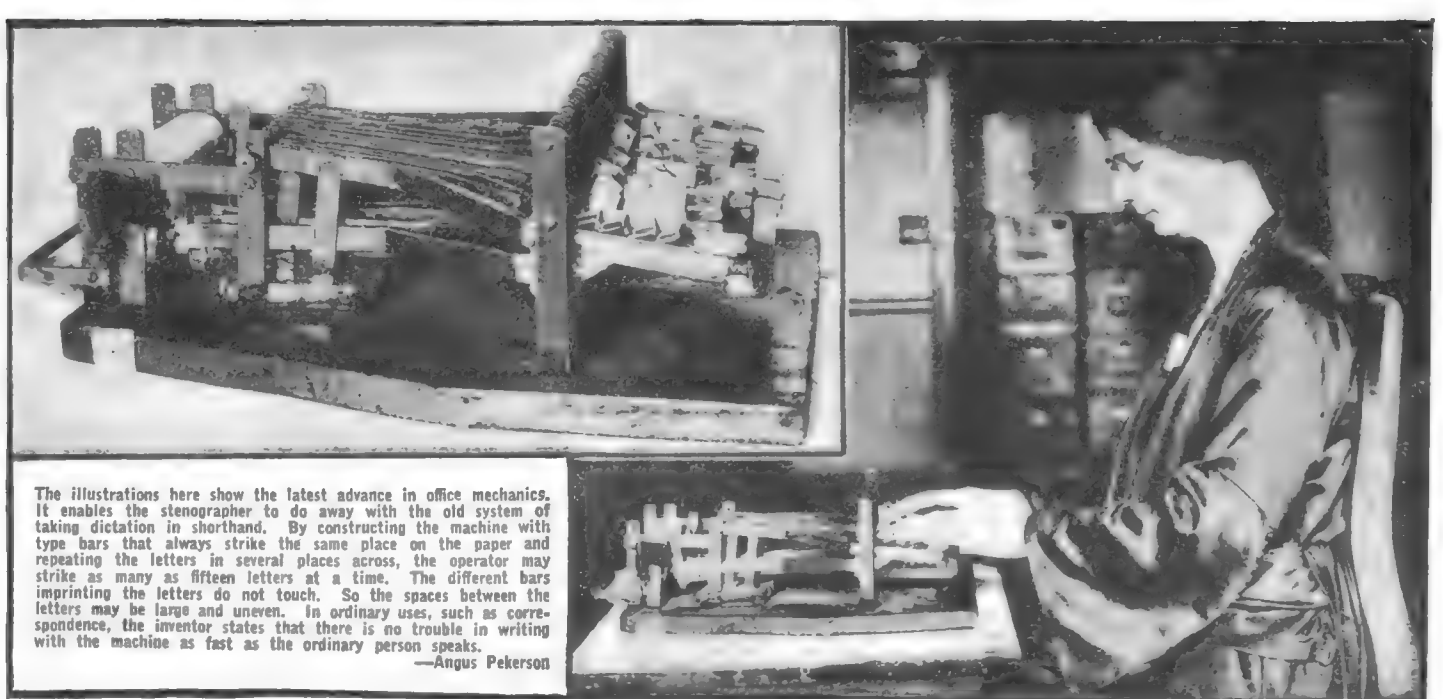
Directly above is shown the method of taking interior scenes that are laid in ships. A replica of the state room is set on rockers. Out of range of the camera a couple of stage hands furnish the power necessary to rock the boat. On the other hand, almost all of the scenes taken from the decks of the vessels are made on the deck of some ship. This introduces a serious problem which is solved as shown on the right.

The close observer at the movie where a number of the scenes are laid on shipboard will notice that in some cases the picture on the screen depicts the sea as moving up and down while the deck remains practically level at all times. In other productions, however, he will note that the deck rolls while the sea remains practically level. This last method will produce so real an effect of the rolling of the ship that the landlubber sitting in a warm, quiet picture theatre will almost become sea-sick at the view cast on the screen before him. The method of obtaining this natural effect is graphically shown in the arrangement of the camera in the inset at the extreme left and in the lower right picture.

By making the tripod fast to the deck, as shown, and supporting the camera on a universal joint, which camera is held horizontal at all times by a heavy weight suspended from it, the actual pitching and tossing of the ship is reproduced on the screen, while in the former method where the rigid camera is simply set up on the deck of the boat, the tossing motion is translated into movement of the sea rather than actually giving the effect of the movement of the ship. In order that the camera may be cranked at a regular speed in spite of its continuous movements with the ship, a small motor is attached to the shaft of the picture machine. A storage battery operates the motor.—Phil Gersdorf.

Logotype--Writes a Word a Stroke

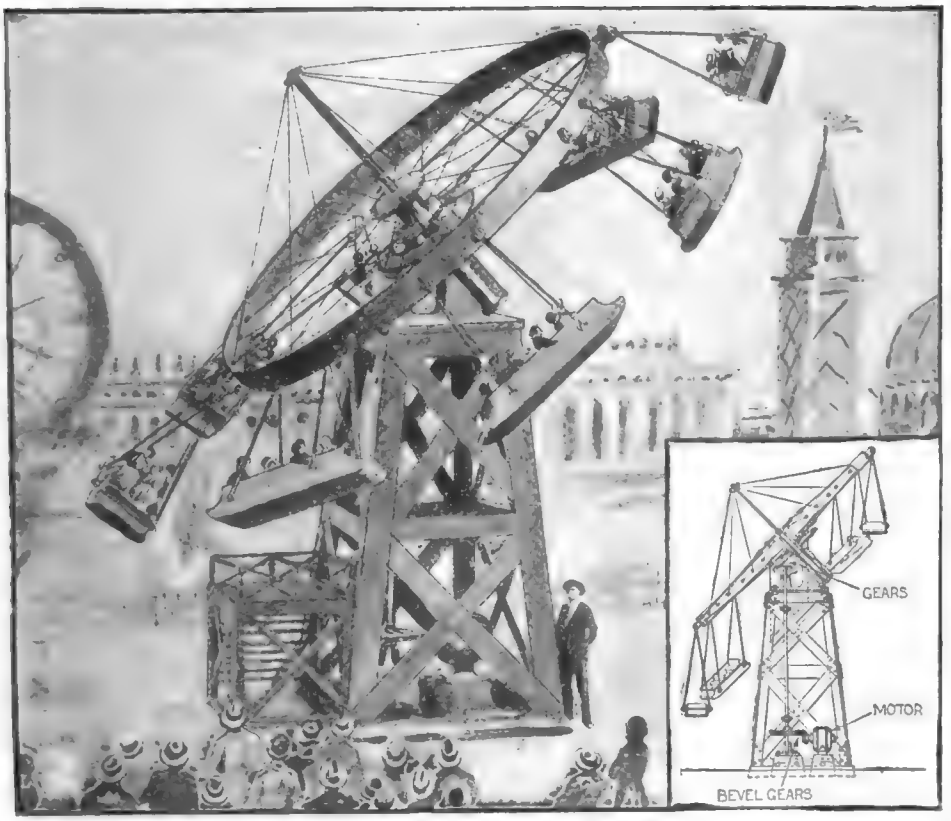
Machine for Taking Dictation Does Not Require a Code



The illustrations here show the latest advance in office mechanics. It enables the stenographer to do away with the old system of taking dictation in shorthand. By constructing the machine with type bars that always strike the same place on the paper and repeating the letters in several places across, the operator may strike as many as fifteen letters at a time. The different bars imprinting the letters do not touch. So the spaces between the letters may be large and uneven. In ordinary uses, such as correspondence, the inventor states that there is no trouble in writing with the machine as fast as the ordinary person speaks.
—Angus Pekerson

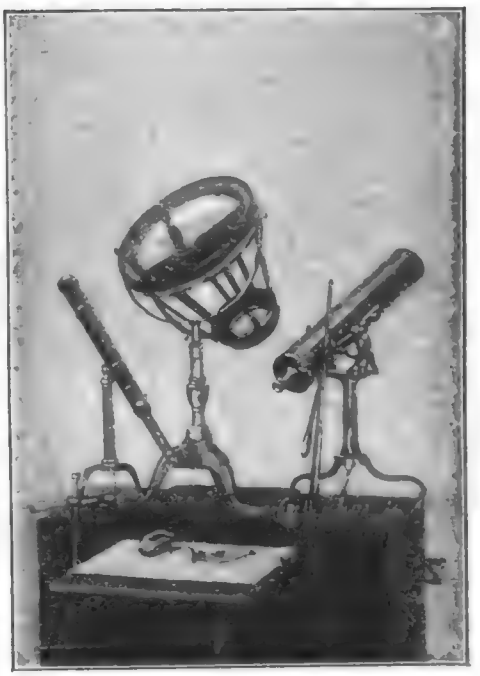
Digitized by Google
Original from UNIVERSITY OF CHICAGO

WHIRL AMUSES JOY-RIDERS--THEIR MONEY AMUSES ITS OWNER



It's just another weapon devised to knock the old Saturday night roll for seven goals, this glorified swing shown above. The sweetest girl in the world says "let's ride"—You do; and the owner rides home in his limousine. But then as long as it's the s.g.i.t.w. what difference does it make? Domenico Tuso invented this machine.

NOTED SCIENTIST'S INSTRUMENTS

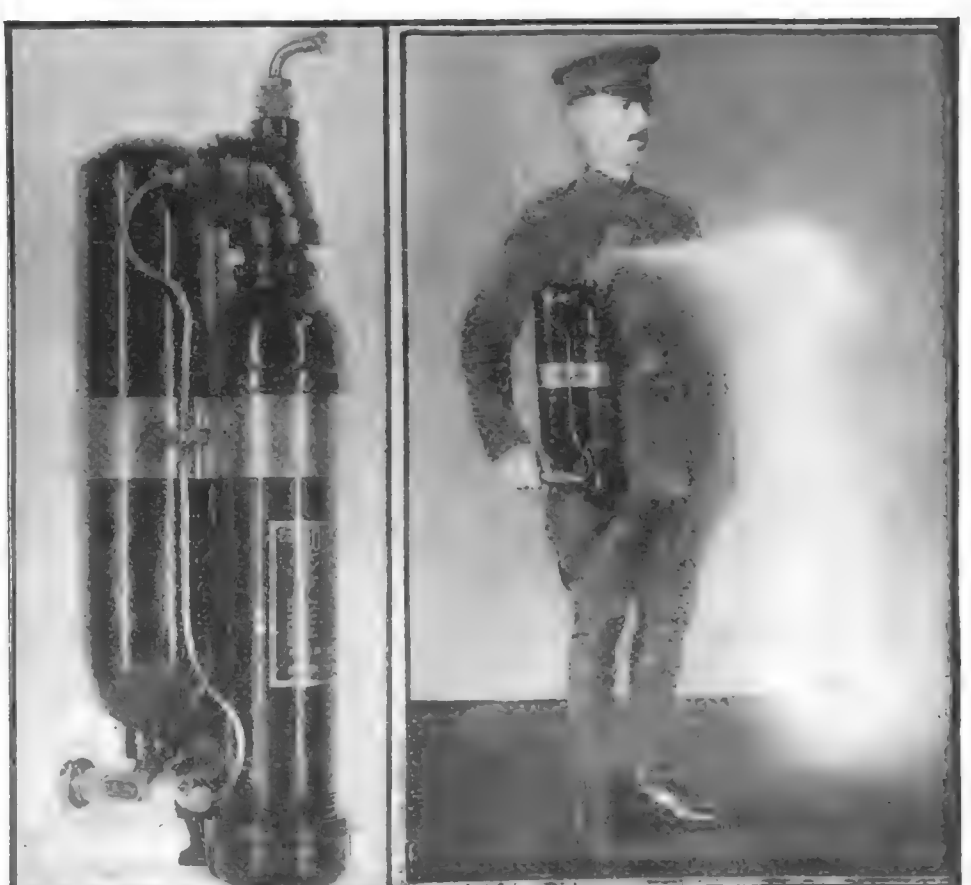


Since Joseph Priestley one day let a tube of mercuric oxide lay beneath the burning glasses shown in the above picture, we are indebted to him for the discovery of oxygen. With the burning glasses are also shown a pair of his telescopes and a flask and tube with ground necks which he used in his experiments. These pieces of apparatus which are the property of Dickinson College, Carlisle, Penn., are some of the most highly prized scientific relics in the country. The college purchased them for $530 in 1811. —Ernest A. Vuilleumier.

PICKLE TESTER

When pickles are of a bright green color it is more than likely that they have been treated with copper, which is a rank poison. To test them for copper content it is only necessary to mash a small portion of the food into fine particles, place it in a jar and cover it with a solution of equal parts of ammonia and water. Close the jar tightly and shake thoroughly. If copper is present the liquid will be bright blue. —S. Leonard Bastin.

GAS GUN TO AID POLICEMEN IN HANDLING MOBS AND CRIMINALS



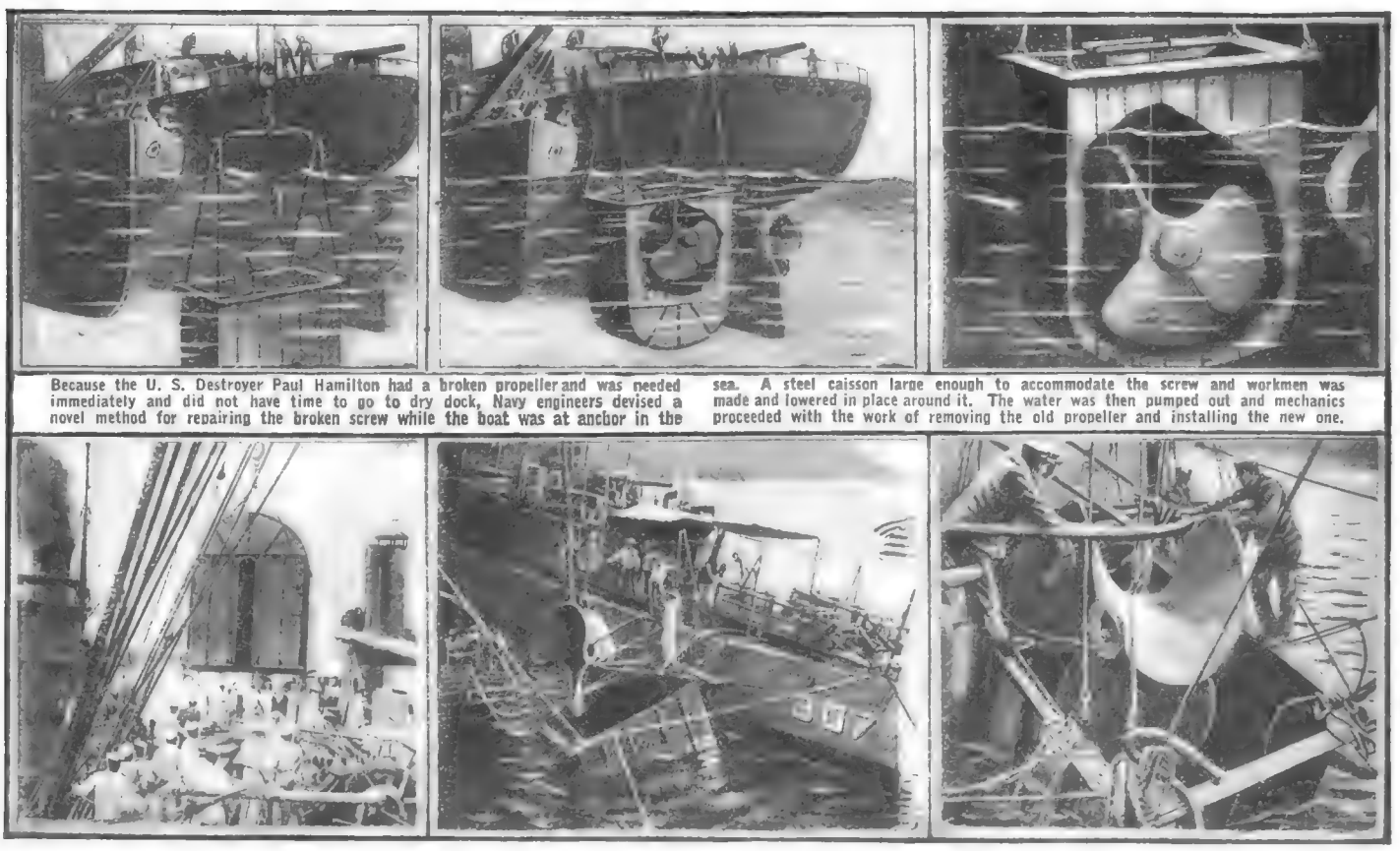
Hereafter when a mob becomes menacing a single patrolman will appear on the scene and quell them with tears, gallons and gallons of 'em—if he uses the tear gas gun shown in the photo to the right. This gun will render untenantable a circle fifty yards in diameter and in war could be used against a whole company. —Ernest Jones.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

New Phonograph Teaches Languages

FOR teaching languages and other subjects where precision of sound is necessary the newly invented logophone will fill successfully a long felt want. The device is simply a phonograph equipped with an electric reproducer and an amplifier. The current carrying the reproduced voice is led to head telephones similar to those used in radio telegraphy and each student is supplied with a set of the receivers. By using this method of carrying the voice a great amount of interference that would ordinarily be caused by noises in the class room is eliminated. The reproduction of sound in receivers is much better, in cases where great precision is desired, than that obtained by the use of a horn. The phonograph has a standard tone arm. The transmitter button is attached to the diaphragm where the sound actuates it instead of passing into the air column of the horn. Switches are provided so that the instructor may break into the circuit by speaking through a microphone at any time it may be necessary. This avoids the necessity of removing the receivers in order to hear what the teacher has to say. The phonograph disc is operated by an electric motor. —O. F. Bond.

Ship's Propeller Repaired at Sea



Because the U. S. Destroyer Paul Hamilton had a broken propeller and was needed immediately and did not have time to go to dry dock, Navy engineers devised a novel method for repairing the broken screw while the boat was at anchor in the sea. A steel caisson large enough to accommodate the screw and workmen was made and lowered in place around it. The water was then pumped out and mechanics proceeded with the work of removing the old propeller and installing the new one.

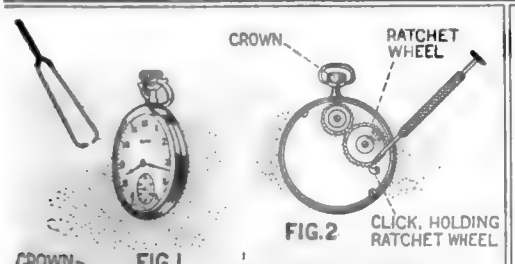
In the above illustrations may be seen the methods used in this unorthodox bit of repairing. Some idea of the size of the task may be gained by noting the size of the caisson and the booms used in lowering it into place. The job of removing the old screw and lowering the new one into place was no small one. —Lt. Com. H. H. Little, U.S.N.

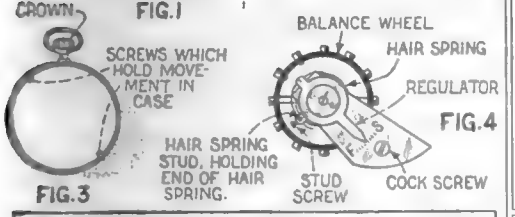
Digitized by Google
Original from UNIVERSITY OF CHICAGO

Timely Talks on Timepieces

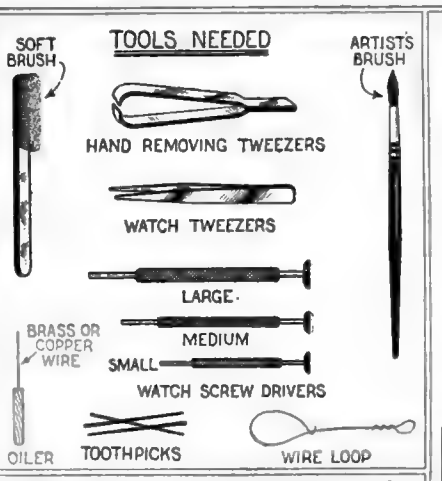
No. 2 of a Series. Cleaning Your Watch

By SAMUEL BERNARD

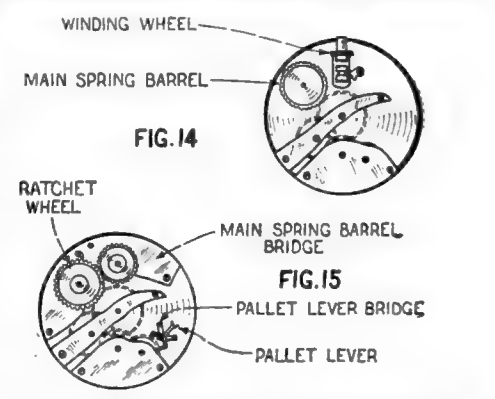




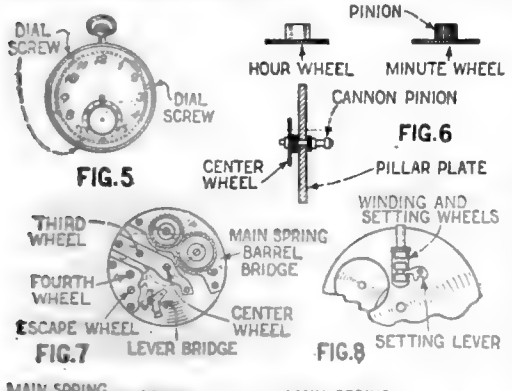
The first step in cleaning the watch is to remove the movement from the case. The hands are taken off with the aid of special tweezers, the main spring is unwound by holding out the ratchet and the balance wheel is removed.

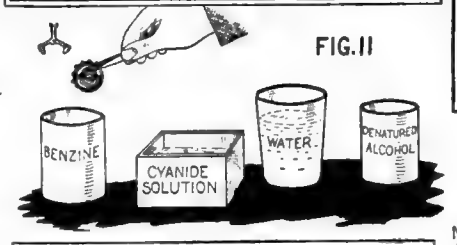


Above are shown the tools necessary for cleaning a watch. They are: three screw drivers of the type shown, brushes, a wire loop, an oiler and toothpicks.

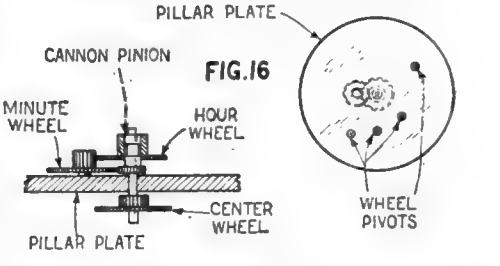


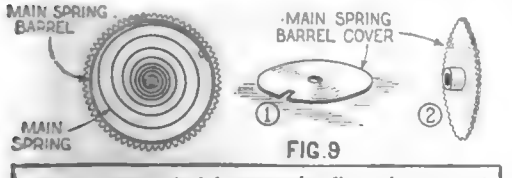
After the first two bridges have been put into place the next step is to place the main spring in position and set the ratchet. The bridge holding it in position is then put into place. Following this operation the pallet lever bridge is put into position and the pallet lever placed and adjusted. A small drop of oil is then placed in each of the cups provided with the aid of the small brass oiler illustrated with the tools. This oil should half fill the cup. All through these operations always handle the fine parts of the instrument with tweezers as contact with the hand is liable to leave a film of grease and dirt on them that will interefere seriously with their proper operation after the complete assembly.



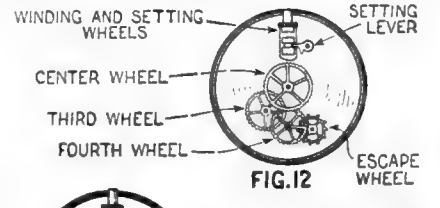


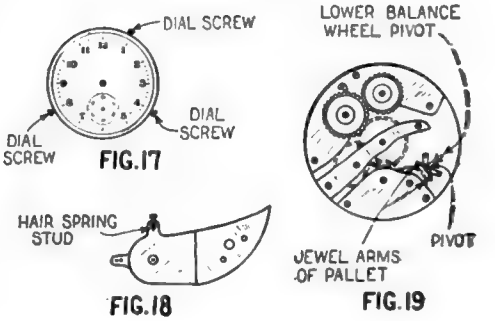
The balance wheel with the hair spring attached is dipped first in benzine, then in the cyanide solution, then in the water and then in the denatured alcohol, as shown above. Then the parts of the balance movement are carefully brushed off with the soft, full artist's brush. Be very careful with the balance and escapement.

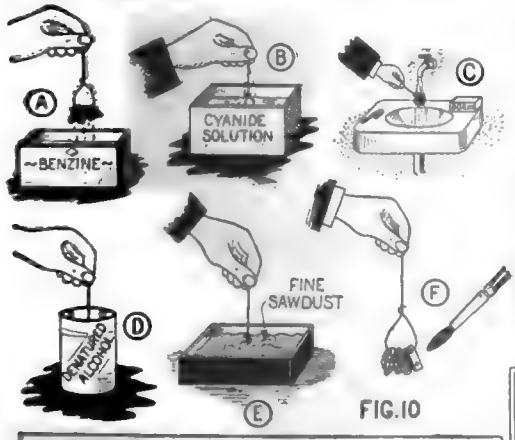




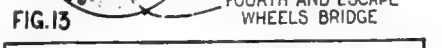
Remove balance wheel by unscrewing the cock screw and the hair spring stud which releases the hair spring. Then remove the hour and minute wheels and the main spring with its barrel. Do not touch winding and setting lever.



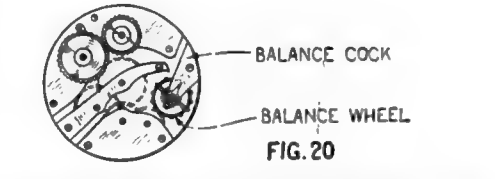




To clean all the parts of the watch with the exception of the balance wheel, hair spring, and escapement movement, the procedure outlined above is followed. The separate parts are placed on the wire loop spoken of and first dipped into a small container of benzine. Then the parts are immersed in the cyanide solution for not more than ten seconds. Following this step, they are removed to a stream of water and allowed to thoroughly rinse for about fifteen seconds. Following this treatment they are placed in a glass of denatured alcohol and then rushed to a box of very fine warm sawdust; then brushed.



With the cleaning process finished the assembly and oiling starts. The reassembling of the watch is exactly the reverse of the dismounting process. First the front plate of the watch is set in place with the center, second and third wheels in place, noting that they are all in their proper position in their bearings. Then the center and third wheel bridge is put in place and then the fourth and escape wheel bridge slipped on, care being taken as above that the bearings are all in place. The screws are put lightly in place first and later screwed down tightly.



The final step in the assembly of the watch is the placing of the balance wheel in position and the adjusting of the hair spring attached to it. The illustration above shows how it fits back into place. First attach the tiny spring to the hair spring stud which fits into the side of the cock. Be careful in this operation that no excessive strain is exerted either upon the balance wheel or the fine spring holding it to the cock. After the wheel, spring and stud are attached the wheel is slipped into place and the cock screwed lightly to the frame. See that the jeweled arms of the pallet fall in the proper position. The next step is to place the dial and hands on the watch. This is done with the three screws provided for that purpose. It would be no less than a crime to put a well cleaned movement into a dirty case. The case is cleaned by dipping it in benzine and then drying it thoroughly with sawdust and a careful brushing. After this the movement is put back into the watch with the aid of the two screws which go into the case from the rear. Enough oil should be placed on the main spring before its installation.

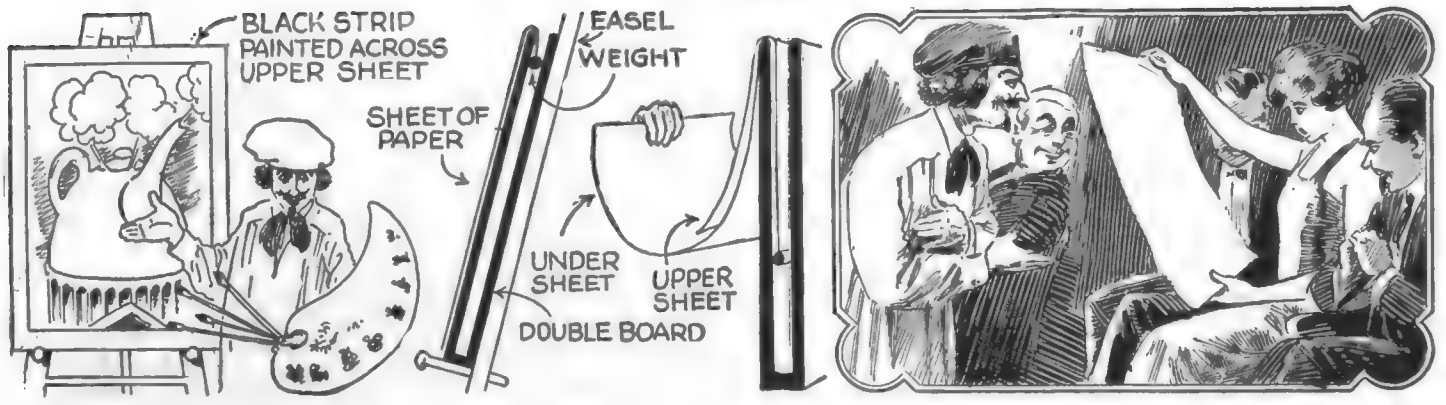
WE would not think of running a typewriter without cleaning and oiling it. How much more important is it that such a delicate instrument as a watch should be carefully attended to if its operation is to be efficient. Every watch should be thoroughly cleaned and oiled at least every two years. The period should be shortened if the watch is subjected to hard wear or exceptional conditions. The method for cleaning them is illustrated on this page.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

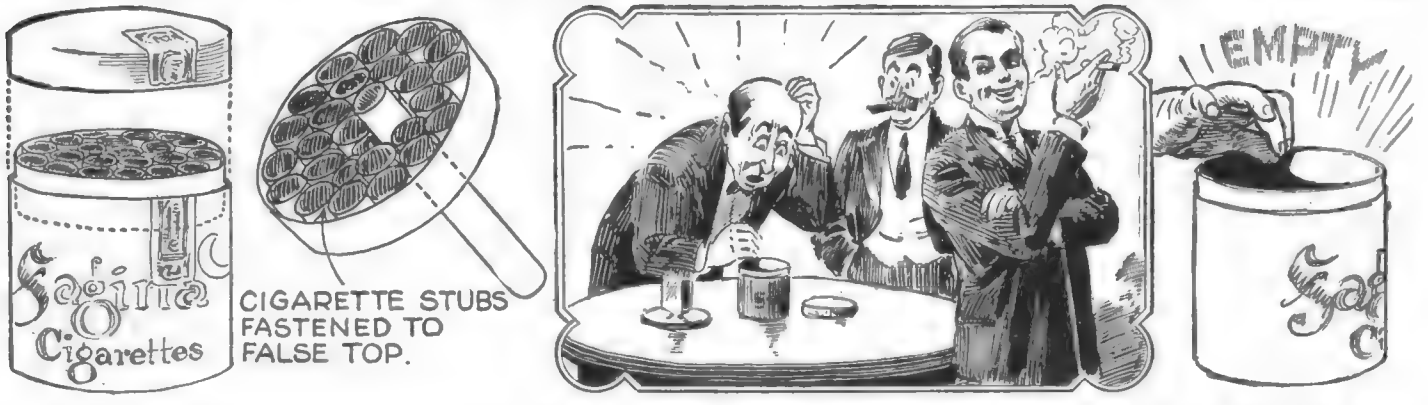
Magic for Everybody

By Prof. JOSEPH DUNNINGER

NO. 14 OF A SERIES

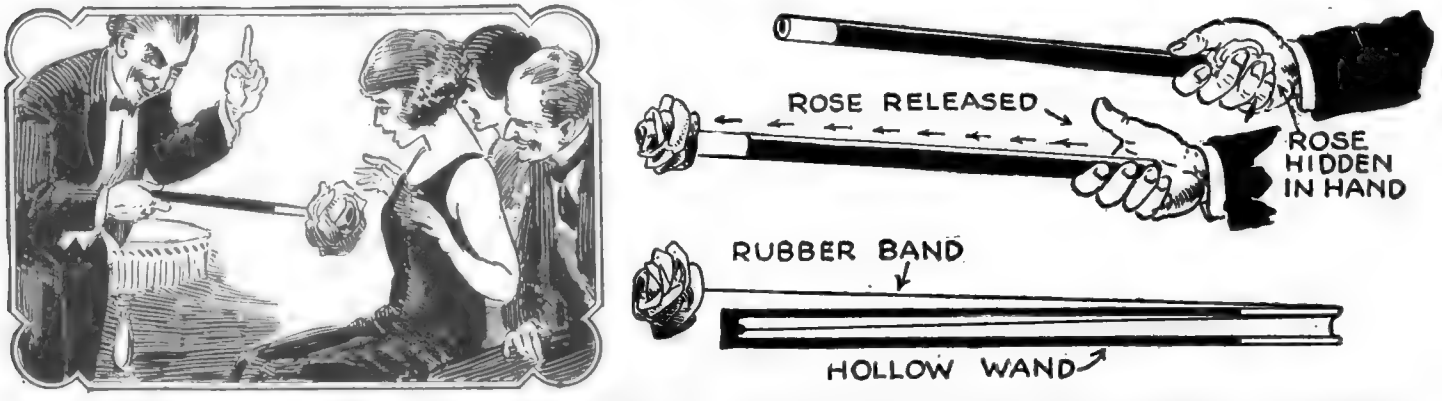


The magician becomes an artist. On an easel a pad of paper is secured. He draws a picture upon the top sheet, and then exhibiting his work to his audience he raises the sheet and tears it off. He walks toward one of his audience and hands her the sheet, which to her amazement is quite devoid of any sketch. The sheet of paper upon which the drawing is made is weighted and passes over the top of the easel. When the sheet of paper is lifted, the one upon which the drawing is made disappears.



The trickster raises the cover from a box of cigarettes, takes one, lights it and replaces the cover. One of his audience is bound to remark that he is rather stingy with his cigarettes, and he informs him to help himself. When the spectator raises the cover from the box, it is found to be empty. The box has a false cover to which cigarette stubs are glued, but contains one whole cigarette which the performer removes. This false top comes off with the cover when taken from the box by the spectator.

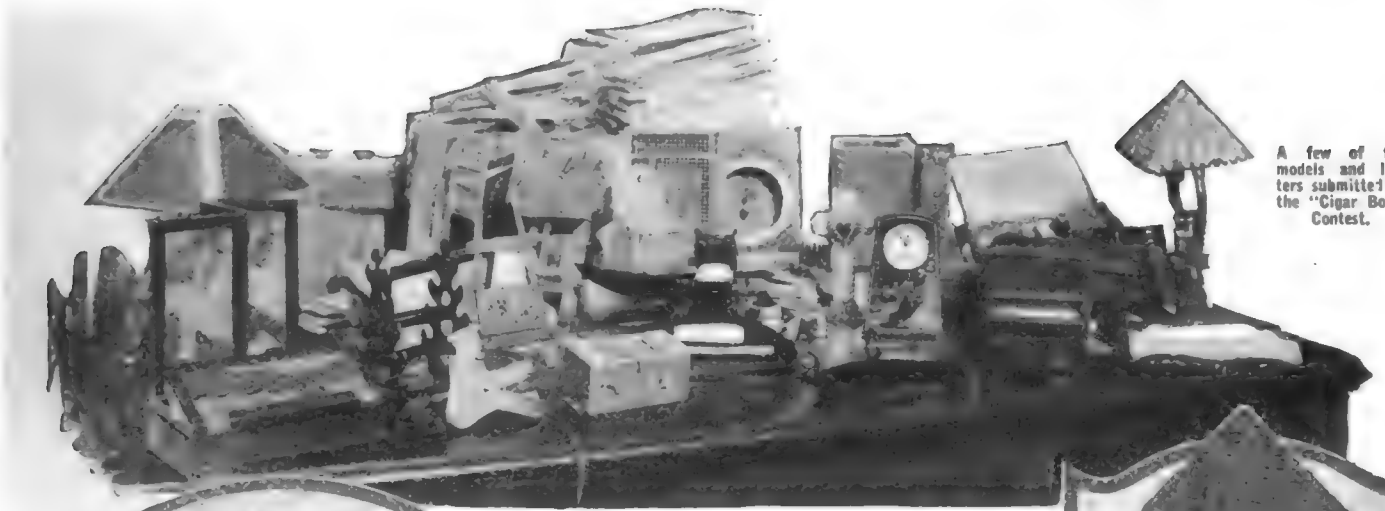
A glass apparently full of wine is raised to the magician's lips, but the happy grin of anticipation changes to a puzzled expression as the wine is seen to disappear before it reaches the performer's mouth. When he brings his hand down again the wine glass fills itself. The explanation is given in the illustration above.



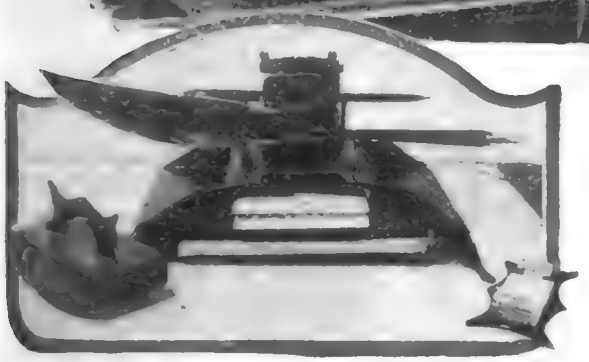
The performer tells one of the fairer members of his group of onlookers that she had better not crush the rose at her waist with her arm. She answers that there is no rose there, but he disagrees with her and passing the end of a wand forward, he withdraws it, which to her amazement now has a rose attached to it. He plucks it off and presents her with it. A rubber band passes out through an opening in the wand, and is then tied to a rose which is held in the performer's hand.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

$100.00 Prize Awards-- Cigar Box Contest



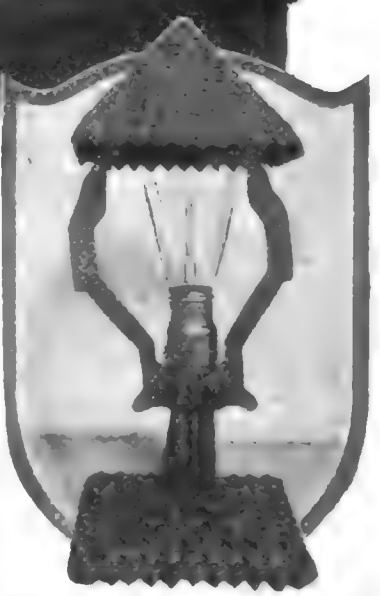
A few of the models and letters submitted in the "Cigar Box" Contest.



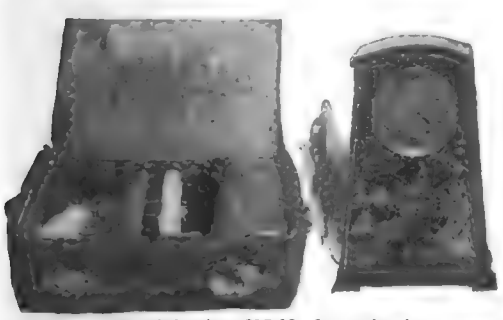
First Prize—$25.00, for desk set. Winner, Olin Alvin Williams.

IN the January issue of this magazine we announced a Cigar Box Contest, in which all the articles submitted were to be constructed of cigar boxes. The cigar boxes could be cut up or used without being cut. This contest offered a prize award totaling $100.00 for the twelve best items submitted. Altogether there were 8,200 entries, only a few of which are shown in the photograph above. Notice the two stacks of letters in back of the models. Photographs of the prize winning models or ideas are shown on this page. Although an article and a sketch of the device submitted was all that was necessary, in nearly every event those who submitted models won prizes. The only exception to this statement is the eighth prize winning idea.

It is always advisable that readers of this magazine enter the prize contests, which are offered in addition to the $12,000 prize contest likewise conducted by this journal. One does not have to know how to write in submitting material for any of these contests. Neither do we require finished drawings. The idea is most important and it is the suggestion of some new idea which our readers desire. Members of the fairer sex won two of the prizes. Other announcements are made elsewhere on this page.

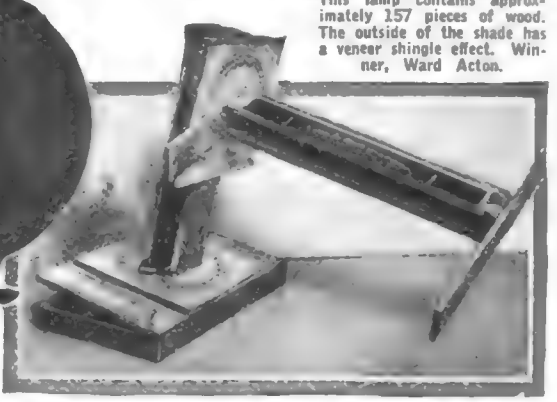


Second prize—$20.00, for an electric lamp. This lamp contains approximately 157 pieces of wood. The outside of the shade has a veneer shingle effect. Winner, Ward Acton.

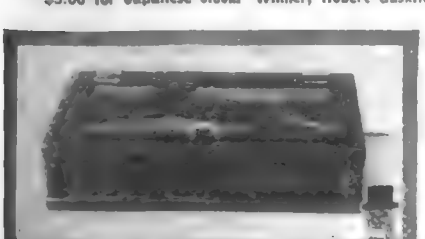


Above left, third prize—$15.00, for sewing box. Winner, Mrs. J. W. Bowers. Right, fifth prize—$5.00 for Japanese clock. Winner, Robert Gaskill.

Above, seventh prize—$5.00 for climbing sailor. Winner, S. J. Cinkus.

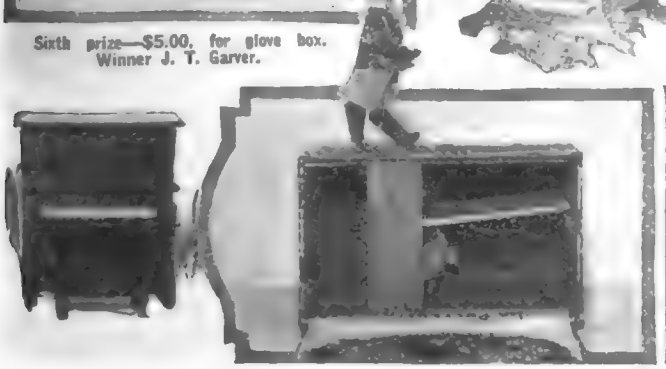


Above, fourth prize—$10.00, equatorial for pointing out constellations. Winner, Edward Johnston.



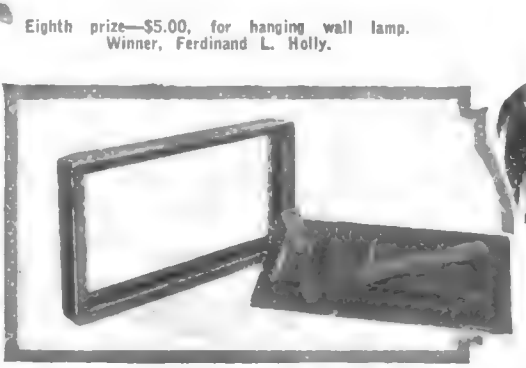
Sixth prize—$5.00, for glove box. Winner J. T. Garver.

Eighth prize—$5.00, for hanging wall lamp. Winner, Ferdinand L. Holly.



Ninth prize—$2.50, for piano model. Winner, Mrs. H. G. Jepson.

Tenth prize—$2.50, for African jigger. Made out of cigar box wood by L. S. Smith.



Eleventh prize—$2.50, for photographic printing frame. Made of cigar box wood by Olin Alvin Williams, Jr.

Twelfth prize—$2.50, for a two way periscope. Photo shows both positions. Winner, Chas. V. Spradley.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Phonograph Needle Contest—$100.00 in Prizes

What Can *You* Do With Phonograph Needles?

NEARLY every family in the United States uses phonograph needles, and even if they do not, a small package of needles can be purchased for less than ten cents. A number of uses are described on this page, but there must be a great many more suggestions which are not here indicated. For the purpose of this contest, which is suggested by J. H. White, the device or devices should be constructed wholly or in part by phonograph needles, or phonograph needles must be employed somewhere in the construction of the device. The needles can be glued together, cemented together or soldered together, and must serve a useful purpose. The conditions of this contest are as follows:

Contest closes in New York on July 10th at 12:00 o'clock midnight.

All material must be in our hands at this time.

No prizes will be awarded for models of suggestions found on this page.

Participants are not limited as to the number of entries. Every man, woman and child is eligible.

A sketch and a 100-word article are all that is necessary, although models should preferably be submitted. In event of a tie for any of the awards, participants so tying will be given prizes identical to those tied for.

Name and address of the contestant should appear on each sheet of paper of the manuscript or drawings and likewise upon the model. A small tag with the name and address upon it can easily be attached to any model.

$100.00 will be awarded

THERE ARE TWELVE PRIZES AS FOLLOWS:

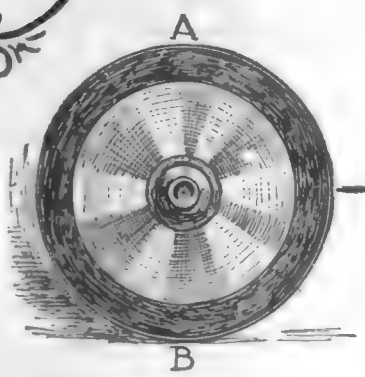
First prize	$25.00
Second prize	20.00
Third prize	15.00
Fourth prize	10.00
Four prizes, each of	5.00
Four prizes, each of	2.50

Digitized by Google
Original from UNIVERSITY OF CHICAGO

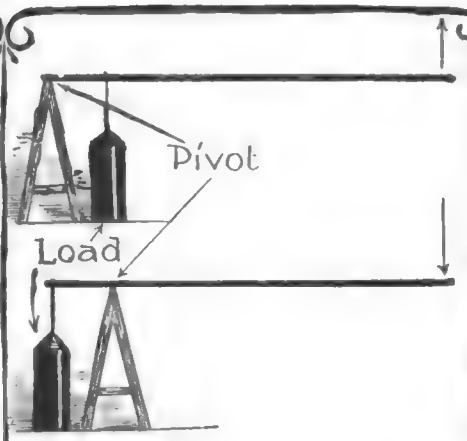
Scientific Problems and Puzzles

Some Fundamental Physical Laws Demonstrated

BY ERNEST K. CHAPIN

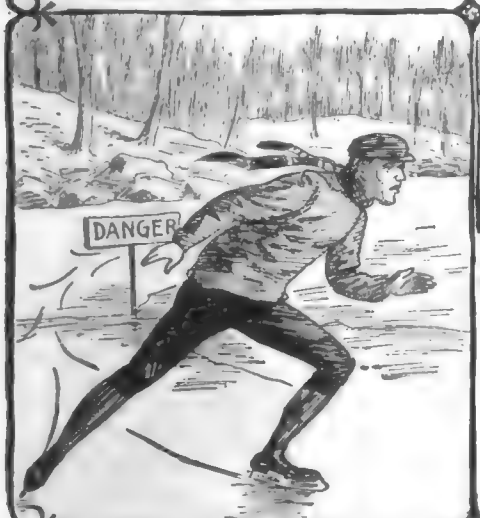


As the wheel demonstrated in the above drawing rolls along the ground how does the speed of the upper part of the wheel at A compare with the speed of the center of the wheel at the hub? Answer to this problem on page 105.

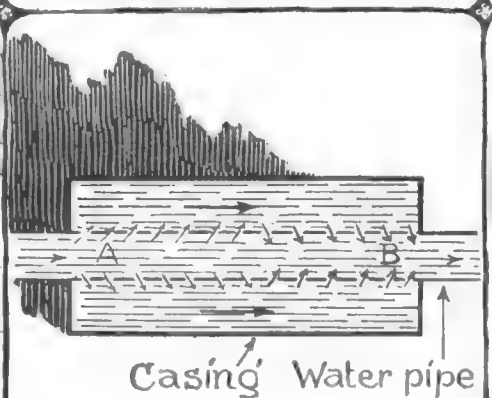


Which of the two forms of levers shown in the diagram above would give the greatest leverage thereby allowing a given load to be raised with the least effort? Assume that the load is the same distance from the pivot in each case.

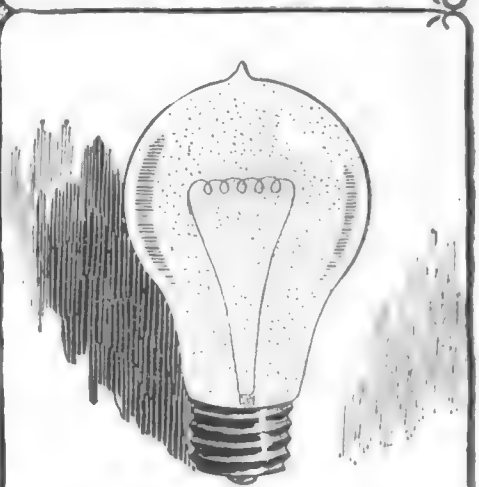
If a man standing on the floor of a swiftly moving truck, as shown in the above illustration, should jump upward would there be any danger of the truck's running out from under him, leaving him to fall to the ground?



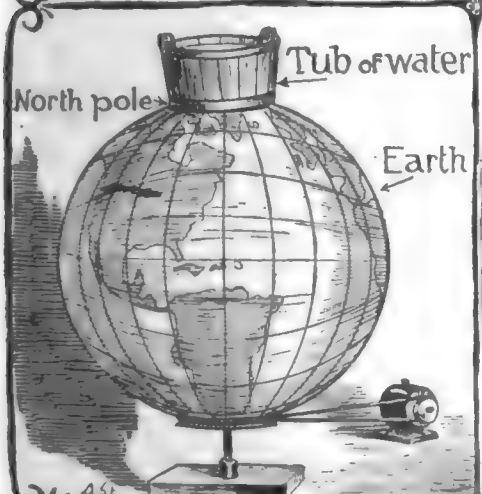
The sight of an expert skater passing swiftly over a stretch of comparatively thin ice which would ordinarily not hold the weight of the skater standing still is more or less common. Why is it that the skater passes the thin ice safely?



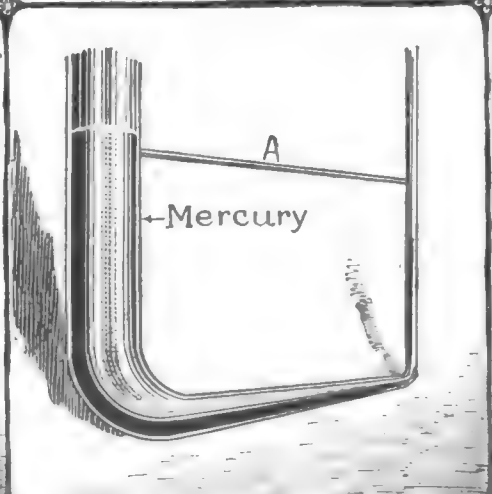
A section of water pipe carrying water at ordinary pressure is drilled with a number of holes; this section of pipe is surrounded with another casing. Does the water follow the course as indicated by the small arrows?



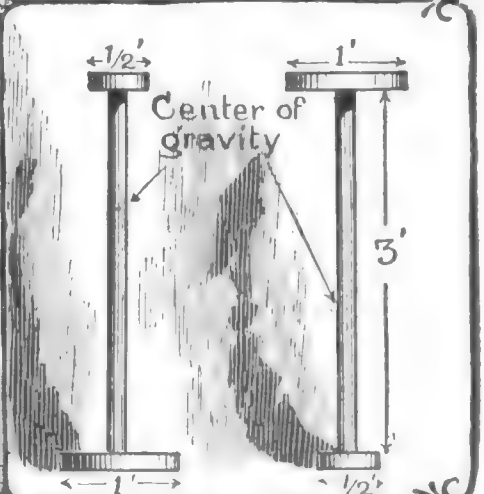
It is a well known fact that there is an electronic atmosphere surrounding the filament of an ordinary incandescent lamp. Why does not the current cut across between the high resistance filament by means of the electronic flow?



If a tub of water is rotating, the water within the vessel turns slower than the tub on account of inertia. If a tub of water was placed at the North Pole would this obtain on account of the earth's rotation?



When mecury is poured into a U-tube one of the arms of which is of very much smaller diameter than the other, the mercury is higher in the larger tube. Is it possible to level the mercury by connecting the arms by a slanting connector?

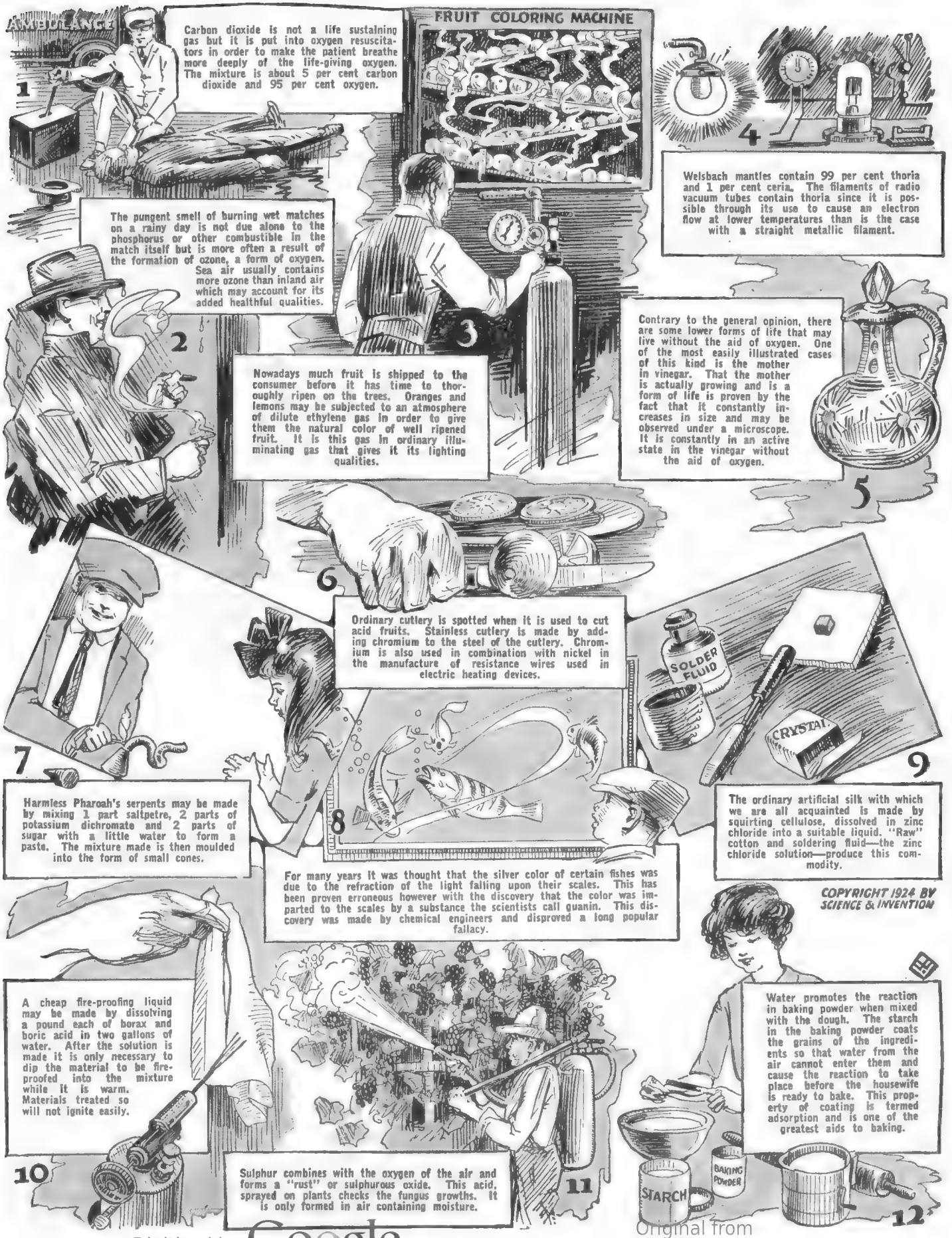


A pedestal with two bases one ½ ft. in diameter and the other 1 ft. in diameter is loaded so that the center of gravity falls one foot from the smaller base. Upon which base will the pedestal have greater stability?

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Everyday Chemistry

BY RAYMOND B. WAILES



1 Carbon dioxide is not a life sustaining gas but it is put into oxygen resuscitators in order to make the patient breathe more deeply of the life-giving oxygen. The mixture is about 5 per cent carbon dioxide and 95 per cent oxygen.

2 The pungent smell of burning wet matches on a rainy day is not due alone to the phosphorus or other combustible in the match itself but is more often a result of the formation of ozone, a form of oxygen. Sea air usually contains more ozone than inland air which may account for its added healthful qualities.

3 Nowadays much fruit is shipped to the consumer before it has time to thoroughly ripen on the trees. Oranges and lemons may be subjected to an atmosphere of dilute ethylene gas in order to give them the natural color of well ripened fruit. It is this gas in ordinary illuminating gas that gives it its lighting qualities.

4 Welsbach mantles contain 99 per cent thoria and 1 per cent ceria. The filaments of radio vacuum tubes contain thoria since it is possible through its use to cause an electron flow at lower temperatures than is the case with a straight metallic filament.

5 Contrary to the general opinion, there are some lower forms of life that may live without the aid of oxygen. One of the most easily illustrated cases of this kind is the mother in vinegar. That the mother is actually growing and is a form of life is proven by the fact that it constantly increases in size and may be observed under a microscope. It is constantly in an active state in the vinegar without the aid of oxygen.

6 Ordinary cutlery is spotted when it is used to cut acid fruits. Stainless cutlery is made by adding chromium to the steel of the cutlery. Chromium is also used in combination with nickel in the manufacture of resistance wires used in electric heating devices.

7 Harmless Pharoah's serpents may be made by mixing 1 part saltpetre, 2 parts of potassium dichromate and 2 parts of sugar with a little water to form a paste. The mixture made is then moulded into the form of small cones.

8 For many years it was thought that the silver color of certain fishes was due to the refraction of the light falling upon their scales. This has been proven erroneous however with the discovery that the color was imparted to the scales by a substance the scientists call guanin. This discovery was made by chemical engineers and disproved a long popular fallacy.

9 The ordinary artificial silk with which we are all acquainted is made by squirting cellulose, dissolved in zinc chloride into a suitable liquid. "Raw" cotton and soldering fluid—the zinc chloride solution—produce this commodity.

COPYRIGHT 1924 BY SCIENCE & INVENTION

10 A cheap fire-proofing liquid may be made by dissolving a pound each of borax and boric acid in two gallons of water. After the solution is made it is only necessary to dip the material to be fireproofed into the mixture while it is warm. Materials treated so will not ignite easily.

11 Sulphur combines with the oxygen of the air and forms a "rust" or sulphurous oxide. This acid, sprayed on plants checks the fungus growths. It is only formed in air containing moisture.

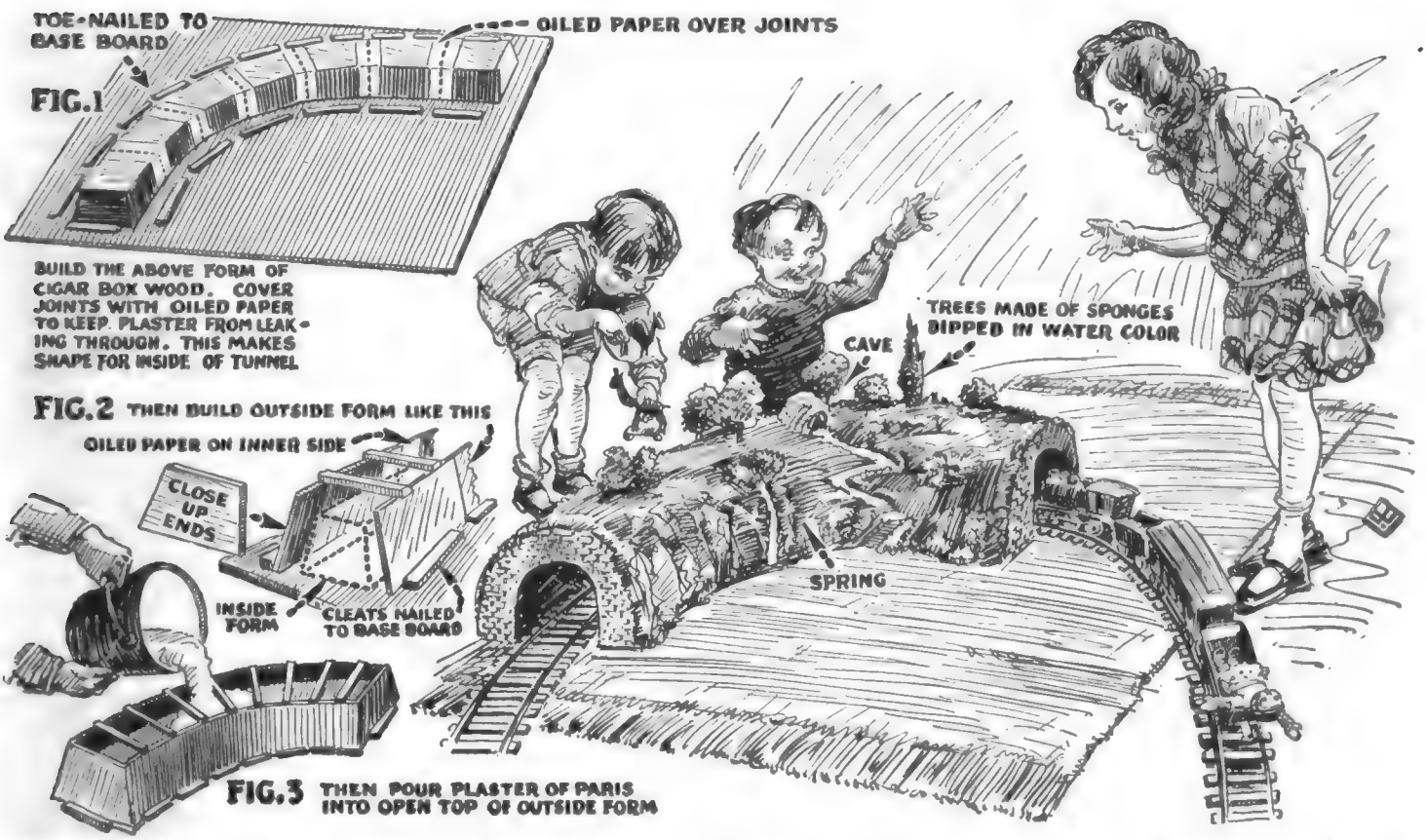
12 Water promotes the reaction in baking powder when mixed with the dough. The starch in the baking powder coats the grains of the ingredients so that water from the air cannot enter them and cause the reaction to take place before the housewife is ready to bake. This property of coating is termed adsorption and is one of the greatest aids to baking.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

THE CONSTRUCTOR

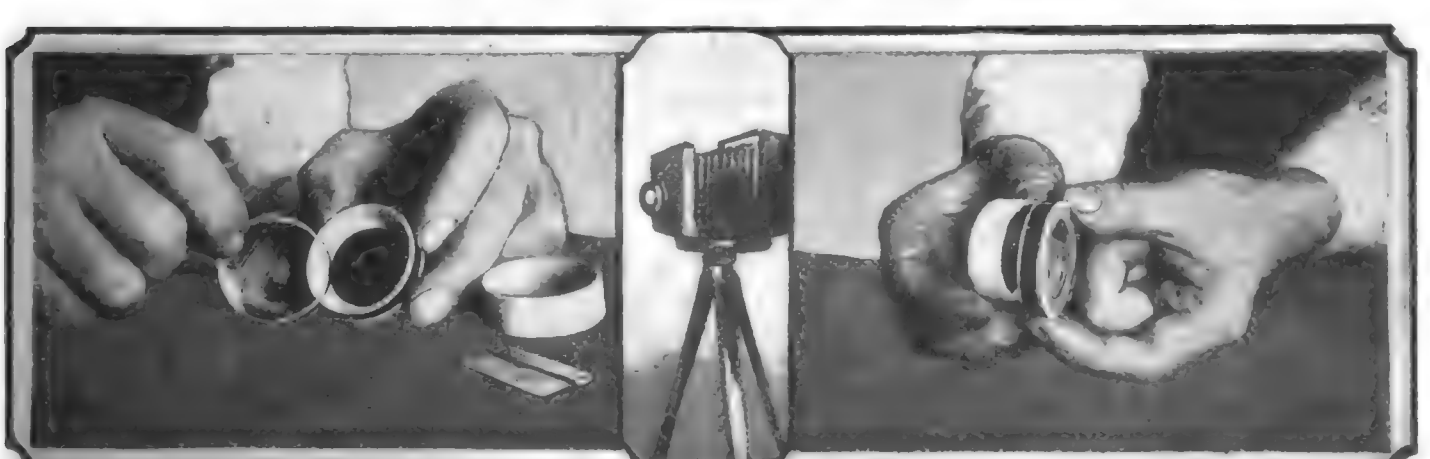
Miniature Railway Tunnel

Plaster of Paris and Cigar Boxes Are Materials Used


TOE-NAILED TO BASE BOARD
OILED PAPER OVER JOINTS
FIG.1
BUILD THE ABOVE FORM OF CIGAR BOX WOOD. COVER JOINTS WITH OILED PAPER TO KEEP PLASTER FROM LEAKING THROUGH. THIS MAKES SHAPE FOR INSIDE OF TUNNEL
FIG.2 THEN BUILD OUTSIDE FORM LIKE THIS
OILED PAPER ON INNER SIDE
CLOSE UP ENDS
INSIDE FORM
CLEATS NAILED TO BASE BOARD
FIG.3 THEN POUR PLASTER OF PARIS INTO OPEN TOP OF OUTSIDE FORM
TREES MADE OF SPONGES DIPPED IN WATER COLOR
CAVE
SPRING

The construction of the decorative tunnel for miniature railroads, illustrated above, is comparatively simple, and may be made by anyone at a small cost. The interior is first shown in Fig. 1, with cigar boxes. Later the outside form is constructed, as shown at Fig. 2, after which the form is filled with plaster of Paris. About twenty pounds will be necessary. Then the decorations on the outside of the tunnel are carved and installed with the aid of a sharp knife, some sponges and water color. The inside of the tunnel should be wide enough to give half an inch clearance on both sides of the train, as it passes through. —W. W. Douglas.

Portrait Attachment for Cameras



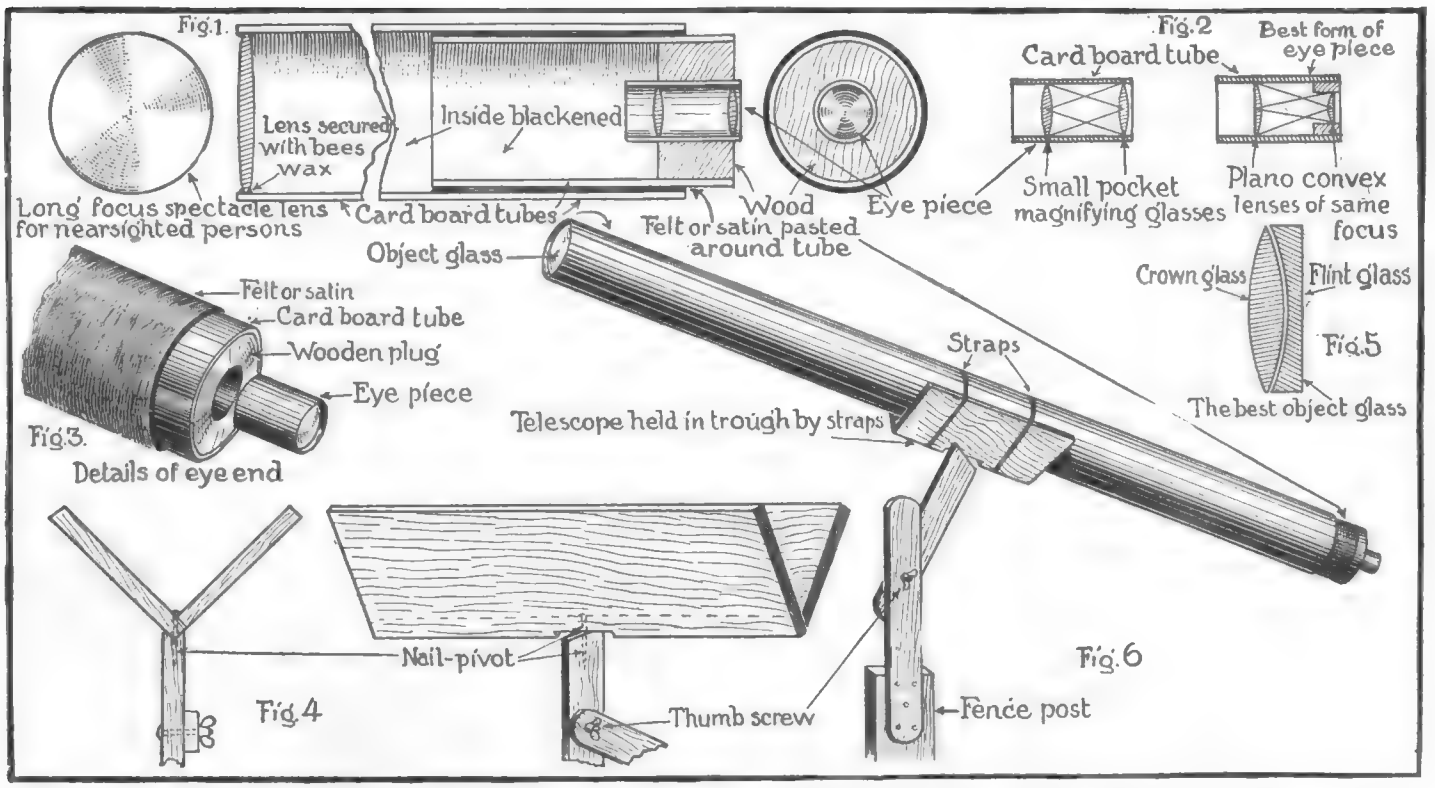
Pill boxes and ordinary spectacle lenses are available in most any locality, and with their aid a short bellows camera can, in some cases, be made to function for copying and portrait work. The construction of the attachment is very simple. First the inside collar is removed from the longer end of the pill box, and a hole is cut through the center of the bottom of the pill box with a sharp safety razor blade, as shown at the left above. The lens is then placed in the bottom section, and the collar replaced holding the lens. The pill box should, of course, be selected of such a size that it will fit snugly over the regular lens. The proper focus lens and its distance from the camera lens must be determined by experiment. Different arrangements will necessitate different lenses, so that three or four such attachments may be made. —Edward H. Flaharty.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

An Inexpensive Telescope

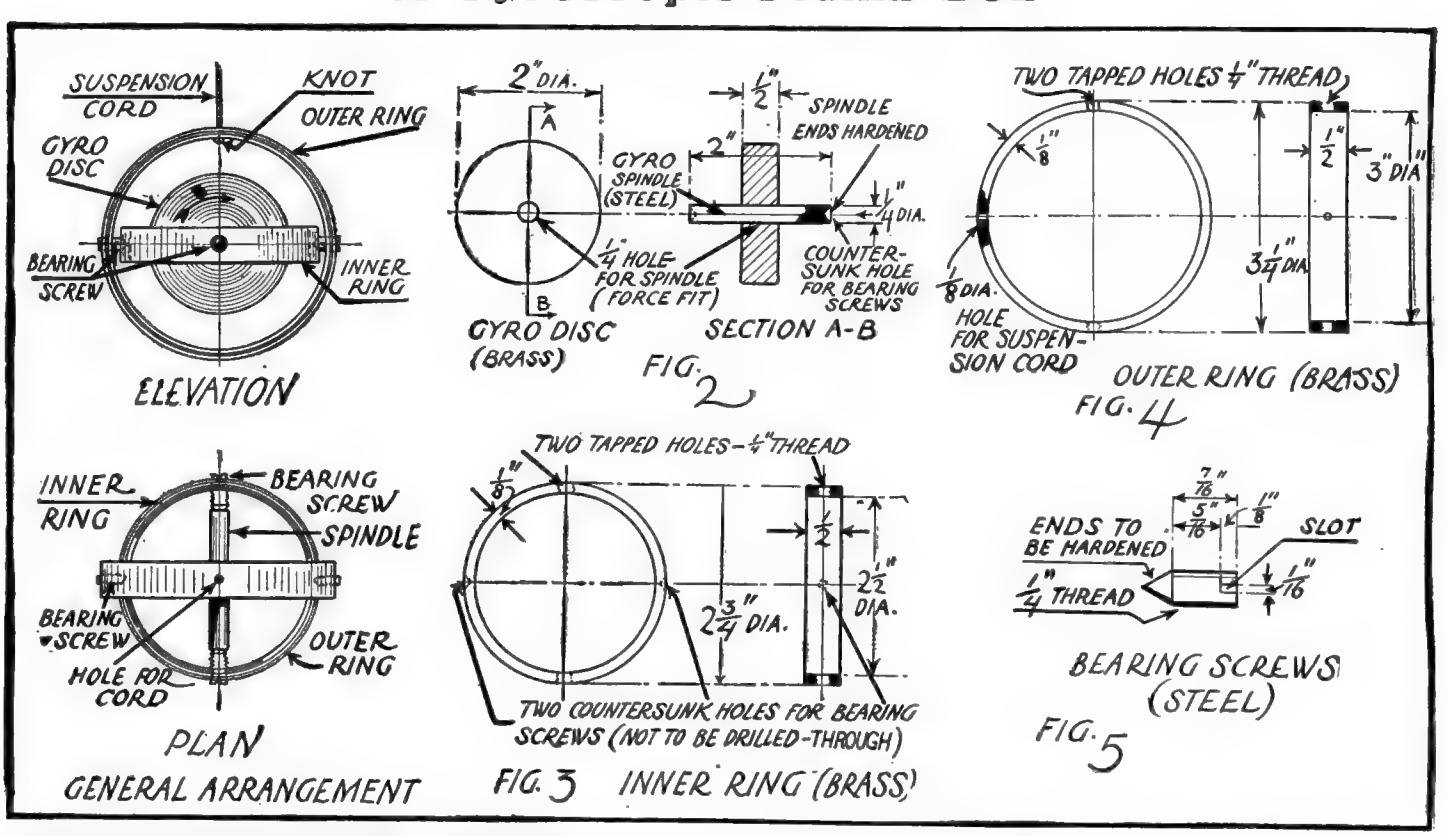
An Instrument Which May be Made with Ordinary Lenses

By DON HOME



With the aid of a spectacle lens, a cardboard mailing tube, and a couple of pocket magnifiers, it is possible to make a telescope that will really work. The lens should be such as is employed to correct far-sighted vision and should have a focal length of thirty to forty inches. The outer tube should be slightly shorter than this figure. With this simple telescope the craters on the moon can be distinctly seen. With a dark glass, sun-spots will be visible and certain stars, single to the naked eye, will appear as double. In order to entirely free the images from color aberration and distortion it is necessary to use the improved eye-piece and object glass. With different sizes of magnifying glasses, it is possible to make several eye-pieces that will give different magnifying powers. The finished instrument can be readily mounted as shown in Figs. 4 and 6.

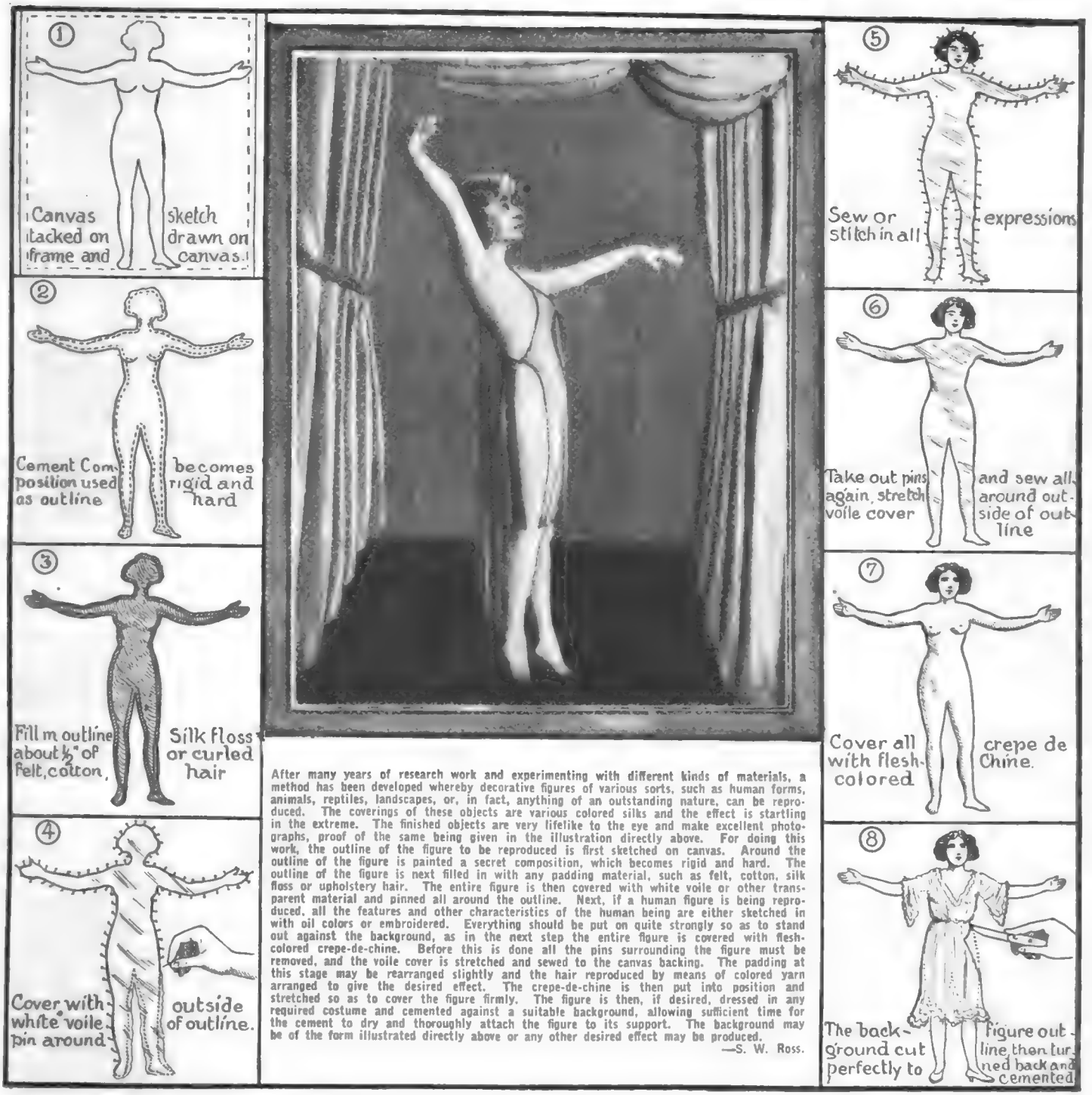
A Gyroscopic Plumb Bob



A gyroscopic plumb bob is of great assistance when accurate lining up has to be done where a light breeze is present or vibrations are caused by machinery which would cause an ordinary plumb bob to swing. The diagrams above show how a plumb bob may be made which will do away with these annoyances. The elevation and plan views of the finished gyroscope are shown. Fig. 2 shows the gyroscope disc cut from a brass bar 2 inches in diameter. The spindle is made of hardened steel. Fig. 3 gives the dimensions of the inner ring and Fig. 4 those of the outer ring. The shape and the dimensions of the bearing screws are given in Fig. 5. After the instrument is made and assembled as shown, the suspension cord is placed in position and a short, strong cord is wound around the spindle. Draw cord off quickly and disc will rotate. —C. A. Oldroyd.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

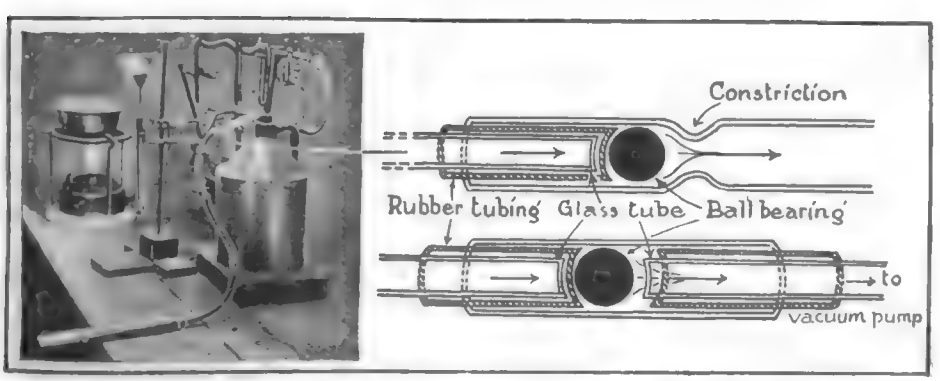
Decorative Objects in Relief



After many years of research work and experimenting with different kinds of materials, a method has been developed whereby decorative figures of various sorts, such as human forms, animals, reptiles, landscapes, or, in fact, anything of an outstanding nature, can be reproduced. The coverings of these objects are various colored silks and the effect is startling in the extreme. The finished objects are very lifelike to the eye and make excellent photographs, proof of the same being given in the illustration directly above. For doing this work, the outline of the figure to be reproduced is first sketched on canvas. Around the outline of the figure is painted a secret composition, which becomes rigid and hard. The outline of the figure is next filled in with any padding material, such as felt, cotton, silk floss or upholstery hair. The entire figure is then covered with white voile or other transparent material and pinned all around the outline. Next, if a human figure is being reproduced, all the features and other characteristics of the human being are either sketched in with oil colors or embroidered. Everything should be put on quite strongly so as to stand out against the background, as in the next step the entire figure is covered with flesh-colored crepe-de-chine. Before this is done all the pins surrounding the figure must be removed, and the voile cover is stretched and sewed to the canvas backing. The padding at this stage may be rearranged slightly and the hair reproduced by means of colored yarn arranged to give the desired effect. The crepe-de-chine is then put into position and stretched so as to cover the figure firmly. The figure is then, if desired, dressed in any required costume and cemented against a suitable background, allowing sufficient time for the cement to dry and thoroughly attach the figure to its support. The background may be of the form illustrated directly above or any other desired effect may be produced.

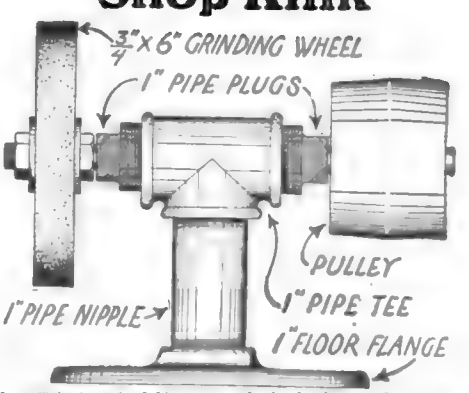
—S. W. Ross.

A Laboratory Vacuum Pump



The vacuum pump itself is made by taking a small bicycle pump apart and reversing the washer. A valve is then made by means of two pieces of glass tubing and a length of rubber tubing as shown above. A small bicycle ball-bearing is used as the valve clapper. The connections of such a pump and valve are also shown. —Dr. E. Bade.

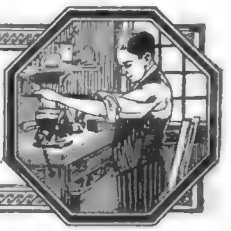
Shop Kink



An efficient and rigid emery wheel stand may be made from pipe fittings as shown. The plugs are drilled for a .5-inch shaft and the emery wheel and pulley, mounted on opposite ends of the shaft. —Harold Jackson, Reporter No. 2903.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

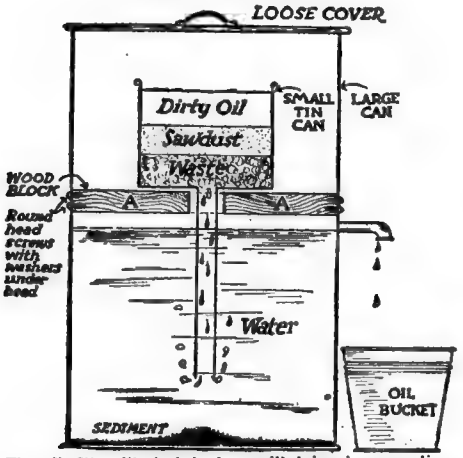
HOW-TO-MAKE-IT



This department will award the following monthly prizes: First prize, $15.00; second prize, $10.00; third prize, $5.00.
The purpose of this department is to stimulate experimenters toward accomplishing new things with old apparatus or old material, and for the most useful, practical and original idea submitted to the Editors of this department a monthly series of prizes will be awarded. For the best idea submitted a prize of $15.00 is awarded; for the second best idea a $10.00 prize, and for the third best a prize of $5.00. The article need not be very elaborate, and rough sketches are sufficient. We will make the mechanical drawings. Use only one side of sheet. Make sketches on separate sheets.

Oil Filter

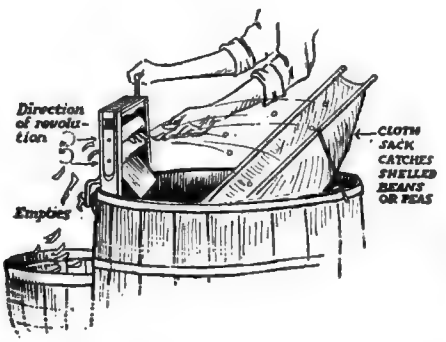
FIRST PRIZE $15



The oil filter illustrated above will bring in many times its value to its owner. Across the center of a 10-gallon can place a wooden shelf to hold the center can, which has a tube attached to its bottom. This can is filled with the filtering substances, sawdust and waste. The oil seeps through, bubbling up through the water.—J. E. Noble.

Bean Sheller

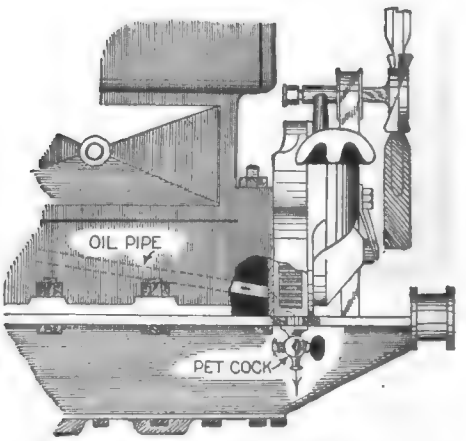
SECOND PRIZE $10



The old family wash wringer is here given a new use. When beans, peas, etc., are being preserved and consequently shelled in large quantities, the above kink will obviously be found very useful. The pods are fed into the wringer as shown. The squeezing force of the rollers force the beans to shoot back against the cloth catcher and carry the pods through into the waste basket on the other side of the wringer. N. W. Hopkins.

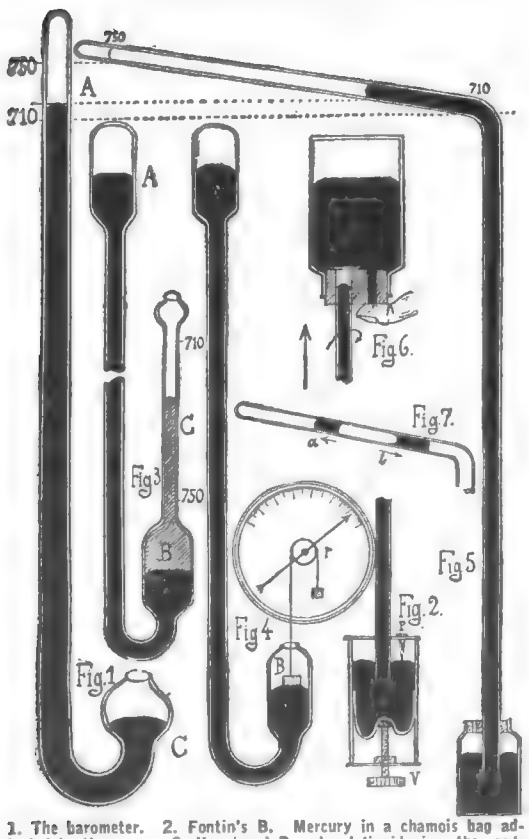
Oil Tests

THIRD PRIZE $5



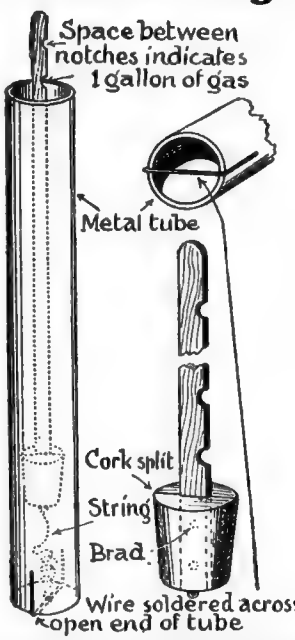
If a small pet cock is installed directly under the large timing gear on a Ford motor an excellent indicator is had as to whether the oil in the motor is circulating properly or not. The pet cock is installed by drilling a small hole in the case just under the timing gear and tapping it to take the cocks shank. —Harold Jackson.

Barometer



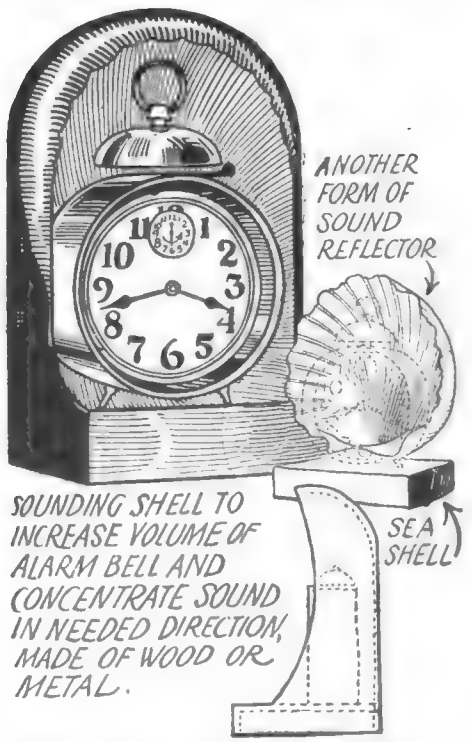
1. The barometer. 2. Fontin's B. Mercury in a chamois bag adjusted by the screw. 3. Huyghens' B. colored liquid gives the reading at C. 4. Hooke's B. the dial and index magnify the reading. 5. The mercury in the inclined tube magnifies the reading greatly. 6. Filling No. 5 the cistern is seen inverted over the lower end of the tube. 7. *a* Convex meniscus—B. is rising; *b* Concave or flattened meniscus—it is falling. —P. Medinger, Luxembourg.

Gasoline Gage



For those cars not equipped with direct reading gas gages the above illustration shows a method which will be found exceptionally useful. A tube slightly longer than the depth of the tank has at one end a piece of heavy wire across it. A cork of slightly less diameter than the tube is fitted with the stick as shown. The stick is notched at points indicating full gallons; both stick and cork are shellacked. A screw eye fits in bottom of cork from which a string runs to the wire across the bottom of the tube. To measure the gasoline simply insert the gauge in the tank and count (feel) the notches above the top of the tube. —L. B. Robbins.

Improved Alarm


ANOTHER FORM OF SOUND REFLECTOR
SOUNDING SHELL TO INCREASE VOLUME OF ALARM BELL AND CONCENTRATE SOUND IN NEEDED DIRECTION, MADE OF WOOD OR METAL.
SEA SHELL

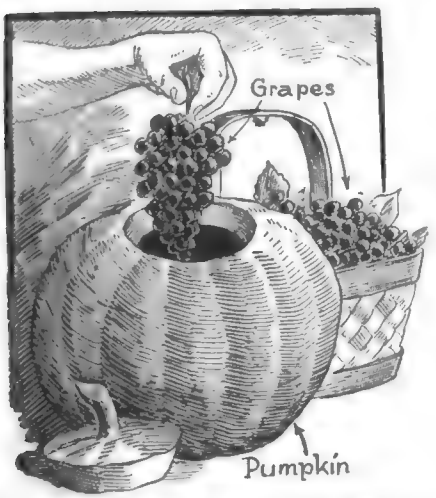
The above illustration graphically shows a method of concentrating the energy from the alarm clock bell by constructing the resonator-like housing similar to the one shown in the above illustration. The sound from the alarm bell is thus thrown out in one direction so that the greatest volume is obtained where it is needed. This resonator can be constructed of wood, metal or shell. It directs the sound from the alarm in much the same manner as the bell directs the sound of a trumpet or cornet.
—Thomas H. Duffy.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

WRINKLES
RECIPES & FORMULAS

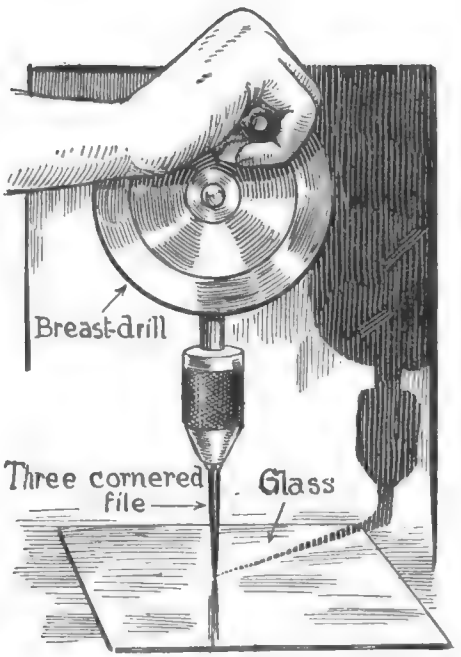
Edited by S. GERNSBACK

Preserving Grapes



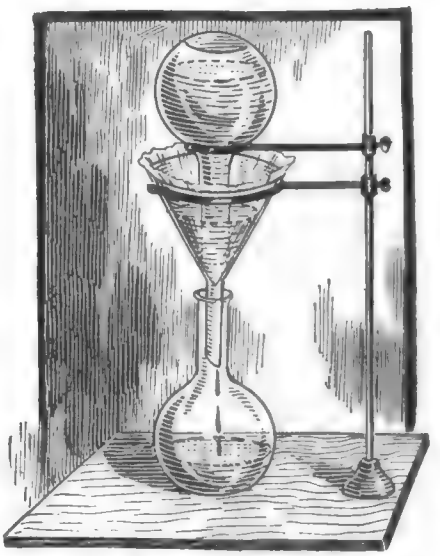
If ripe grapes are inserted in a ripe pumpkin shortly after they are picked and while they are still clinging in a cluster as shown they can be kept fresh for months if the pumpkin is kept in a cool place. —Wm. H. Seitsinger.

Glass Drill



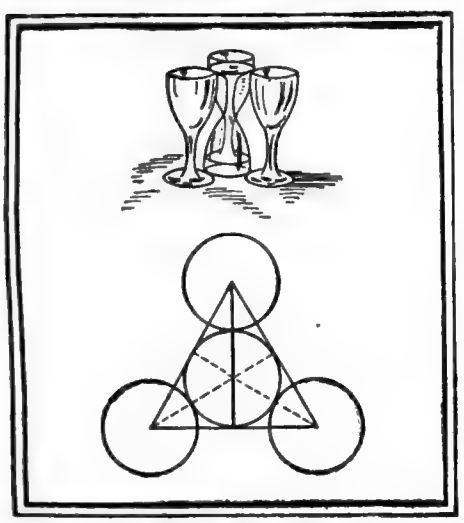
If a three-cornered file is ground down to smoothness and to a fine point with the three sharp edges remaining intact and this is used as a drill in connection with an ordinary brace or breast drill, an efficient glass boring tool results. The drill is lubricated with a mixture of pitch and turpentine mixed to the consistency of glycerine. —W. E. Bramel.

Filter Kink



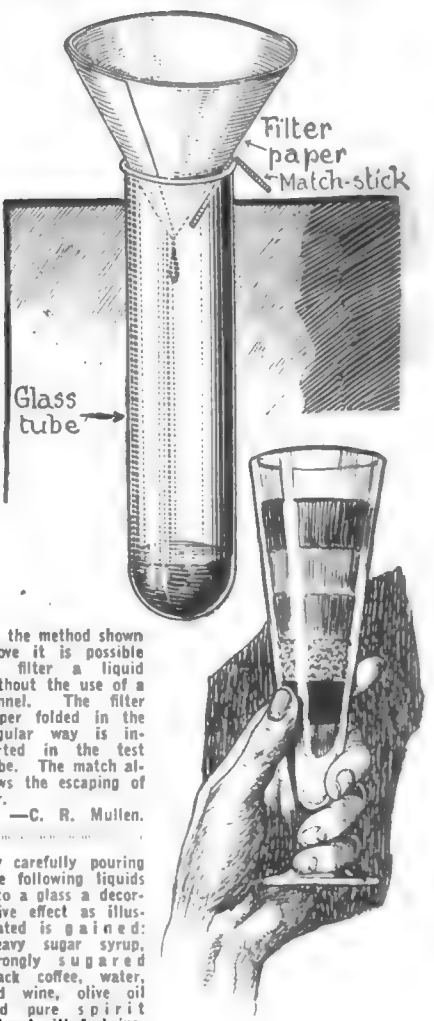
For filtering large quantities of liquid without attention, place the large bottle neck down in the filter funnel and the flow of liquid will adjust itself. —Willard Robinson.

Geometrical Problem



The problem whose solution is shown above is to place four tumblers so that the four centers of their bottoms as well as the four centers of their tops are equi-distant from each other. —Dr. Albert Neuberger.

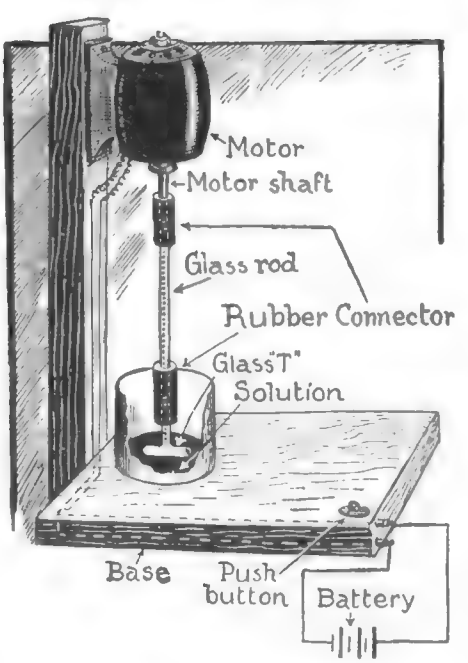
Laboratory Hint



By the method shown above it is possible to filter a liquid without the use of a funnel. The filter paper folded in the regular way is inserted in the test tube. The match allows the escaping of air. —C. R. Mullen.

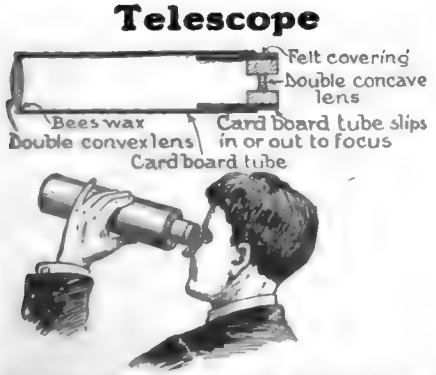
By carefully pouring the following liquids into a glass a decorative effect as illustrated is gained: Heavy sugar syrup, strongly sugared black coffee, water, red wine, olive oil and pure spirit colored with fuchsine. —Dr. A. Neuburger.

Mechanical Mixer



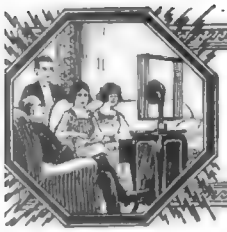
Around the amateur laboratory many times there is a need for a mechanical mixer which will run for a length of time without attention from the experimenter. Such a mixer is shown here. The small motor is mounted on an upright and an extension shaft is fixed to the motor shaft with a stiff piece of rubber tubing. The mixing attachment consists of a glass "T" fixed to the extension shaft with another piece of rubber tubing. —Robert R. Garner.

Telescope

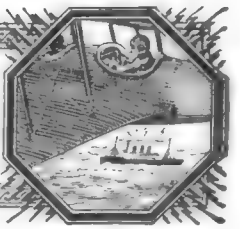


If a double convex lens is held in one end of a cardboard tube with beeswax and a small pocket magnifier is placed in the other end of the tube as shown and the lens is focused a telescope results. —Don Home.

Digitized by Google
Original from UNIVERSITY OF CHICAGO



RADIO



Relay of Radio Broadcasting

SIMULTANEOUS broadcasting is by no means a new feature to the radio public, but heretofore the usual method was to connect the various participating broadcasting stations by telephone lines. However, a triumph of radio was recently performed wherein six radio stations took part in a relay system which covered the entire United States, parts of Canada and Mexico, England, and the western part of Central Europe. Only a very few miles of telephone lines were used, linking the Waldorf-Astoria Hotel with station WJZ in New York City and the latter with station WGY in Schenectady, N. Y. This is shown at the left. A new system of short wave transmission and reception was pressed into service and took the place of the telephone lines usually used. The stations participating in the relay and the wavelengths on which they transmitted are shown and indicated above. The dotted lines connecting the stations indicate the relay wavelengths and the flashes emanating from the towers, the broadcasting waves. A banquet was being given by the Massachusetts Institute of Technology at the Waldorf-Astoria and the after dinner speeches and music were transmitted by telephone to WJZ. From here the signals followed the various relay and broadcasting routes illustrated.

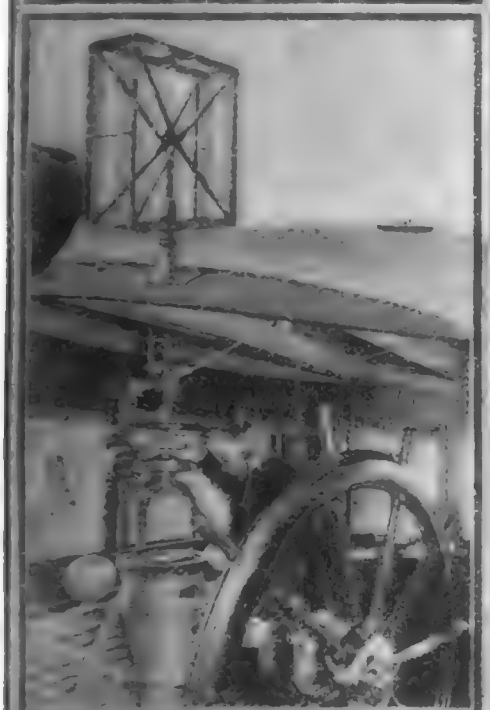
Digitized by Google
Original from UNIVERSITY OF CHICAGO

Position Finding by Radio

Details of the Workings of the Radio Compass

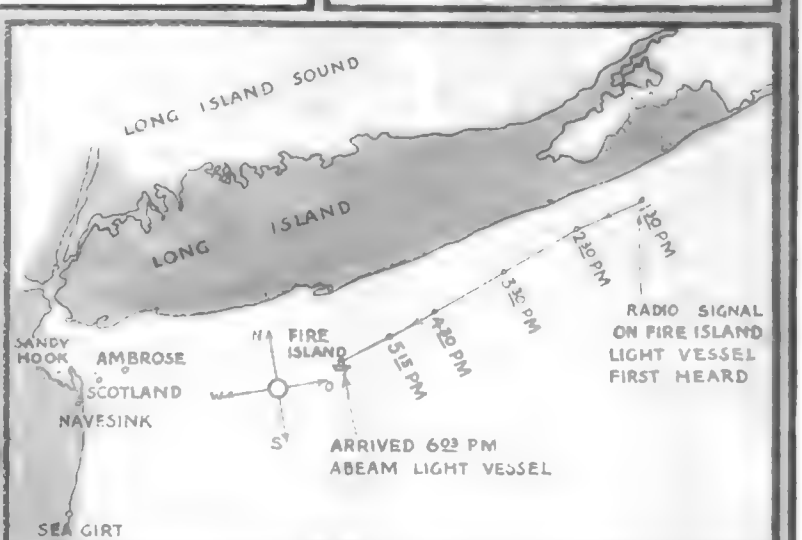
By J. W. VON STEIN*

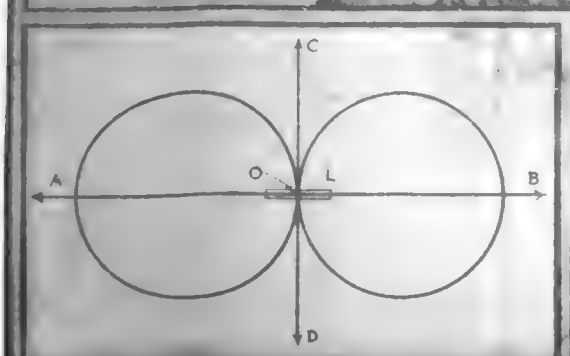
The photograph directly below shows a cross sectional view of the installation of a Kolster radio compass on board ship. The directional loop aerial is so arranged that it can be rotated as desired by means of a hand wheel shown so as to have the plane of the loop in either the direction of the incoming signal or at a right angle to that direction. The position to be used depends upon the type of reading to be taken and the method of working is described at the bottom of this page.



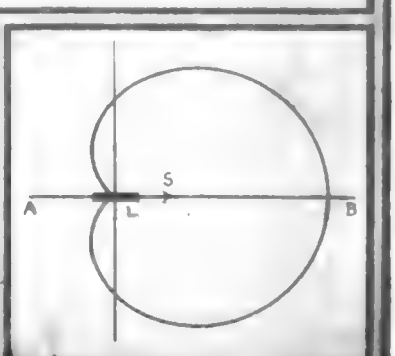
The photograph at the left shows a close-up view of the controlling mechanism of the perfected radio compass. The operator swings the loop by means of the hand wheel shown, at the same time listening in on the radio receiving set which may be seen in the lower right corner of the illustration. The photograph directly below shows a still closer view of the compass itself. The U-shaped arm carries two cross-hairs which are placed directly above each other in order to get the bearing directly on the compass.

The ship equipped with the compass can get its own bearings and can also aid nearby vessels not equipped with the radio compass. This is illustrated in the drawing at the left below. The ship equipped with the compass plots its exact position and then radios it to the nearby vessel. The drawing is, of course, somewhat exaggerated so as to show the arrangement more clearly. The illustration at the right below shows how a vessel was able to proceed through a heavy fog along the coast of Long Island and come to anchor directly off Fire Island, being guided solely by the radio compass, the signals being sent out by the Fire Island radio station.





The loop aerial as used in the average radio receiving set is directional in two ways and therefore unless special provisions are made, it cannot be determined in exactly which direction the radio transmitter is located. The curve shown at the left illustrates this. The loop is indicated by L and the station from which reception is good may be either in direction A or B. Signals from stations located in the direction of C or D will be very weak or inaudible. When it is desired to get a unidirectional bearing, certain changes are made in the receiving set whereupon it will be found that the signals will vary in accordance with the curved line in the illustration at the right. Stations in the direction of B will be extremely loud. The directional bearings as illustrated at the left are much more accurate than the unidirectional bearings and therefore both are usually taken; the first to determine the general direction of the transmitter and the second the exact direction. The signals received are standard ones sent out by compass station transmitters.

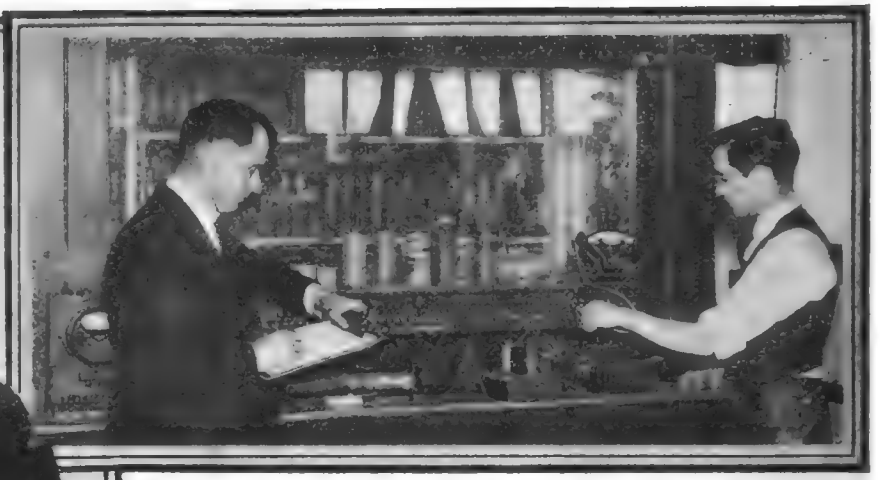


* Reporter No. 126.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Radio Experimenters

Some Sidelights On Radio Developments



The photograph directly above shows the two men of the Bureau of Standards who are directly responsible for the action of dry cells of all makes, sizes and types. They are Mr. J. P. Schradt (left) and Mr. A. F. Baillio. Their work consists of making comparative tests on dry cells to determine their voltage, amperage and ability to stand up under a heavy drain. This department has been rushed to the limit since the new dry cell vacuum tubes have come out as they have to test all the different types of radio batteries before they are put on the market to make sure that they come up to the claims of the manufacturers. The photograph above shows them at their test table with the apparatus for making the comparative tests arranged in front of them. Complete records are kept so that it is practically impossible for any concern to pass out to the public inferior dry cells, either for "A" or "B" battery use.

Cigar Box Contest enthusiasts attention! The illustration at the left shows just one of the many thousands of uses to which these versatile boxes can be put. Mr. Felian Garcia, a New York City amateur, has built a complete receiving set in a cigar box. The circuit used is that of the well known Flewelling simplified super. The tuner, as will be seen, consists of two spiderweb coils and two variable condensers. The set as illustrated contains everything necessary for reception including two pair of phones. The aerial and ground, of course, are separate, although a small coil of wire can be carried in the compartment with the phones and used as an antenna. For a set of this type, the outfit shown is extremely well built and contrary to the usual portable set it is entirely practical. As will be seen, the "A" and "B" batteries are contained within the cabinet, the "A" battery consisting of four flashlight cells of the type usually employed in tubular flashlights. The spiderweb coils which are arranged on the back of the cover are so placed that when the cover is opened, the coupling between the two coils can be varied at will.

Radio has become such a part of our daily life that it is now being taught in many schools throughout the country. The photograph at the right shows some examples of the sets built by boys in the manual training and science classes of a New York City school. The sets illustrated are the cream of all those made in the school and each one of them have made some enviable "DX" records. They are almost entirely home-made, only those parts which are too complicated to construct having been bought. Thus we see that the schools have changed quite a lot in the past few years as now the boys can play while they work and when they get through with their work have a substantial and practical radio receiving set to show for their labor. The sets made show considerable ingenuity and are workmanlike in the extreme.

The photograph at the left shows Mr. E. H. Youngs of the U. S. Bureau of Standards at Washington, D. C., at work in his laboratory. Mr. Youngs is an authority on the measurement of frequencies and has charge of the checking of the frequency of the transmitted signals from high powered radio stations throughout the country. He is shown operating some of the essential and efficient apparatus used by the Bureau. Mr. Youngs also at times checks up on the outgoing signals of various amateur radio stations throughout the country and keeps them within their lawful frequency. The apparatus used for this work, most of which is shown at the left, is most efficient in operation and all of the scales are accurately calibrated. Various standard instruments are used which have been designed by competent engineers of the Bureau so that the actual work of measuring frequencies is reduced to a

Digitized by Google
Original from UNIVERSITY OF CHICAGO

New Uses of Radio

Glimpses of Some of Its Varied Rôles

Will a week or even a day ever go by during which someone will not come out with "the world's smallest radio set?" It seems that every radio bug's chief ambition is to construct a set that, regardless of its efficiency, will be very small in size. We illustrate above a set made by Edmond Campbell of Washington, D. C. The maker, who is only fourteen years of age, estimates its cost at about 80c. The tuning coil is made of wire taken from a door bell buzzer and a small crystal detector is used. The entire outfit is small enough to fit in a match box and the maker claims that it will receive all the local stations quite clearly. However, we question its selectivity.

Who has never heard a broadcast listener say, "Darn that amateur with his dots and dashes," or words to that effect? (usually much stronger than the above and therefore unprintable). In the majority of cases however the dots and dashes or as they should be called the code transmission is not from amateurs, but from the high powered government and commercial stations and ships at sea. If the broadcast listener has a good receiving set which is capable of doing any tuning that can be called tuning, he will not experience interference from these stations unless he is very close to them, and then the best remedy is to move away. We say the above in all sincerity because amateurs do not cause much of the interference, as they are confined to certain working hours by the government. The photograph directly above shows the government operators at station NAH, Brooklyn Navy Yard, listening in and determining just who does cause the interference. Amateurs are checked up as to operating hours and wave-length and "called down" if they are in the wrong. The operators at the Navy Yard, however, lay most of the blame on foreign ships and freighters in harbors, lakes and rivers.

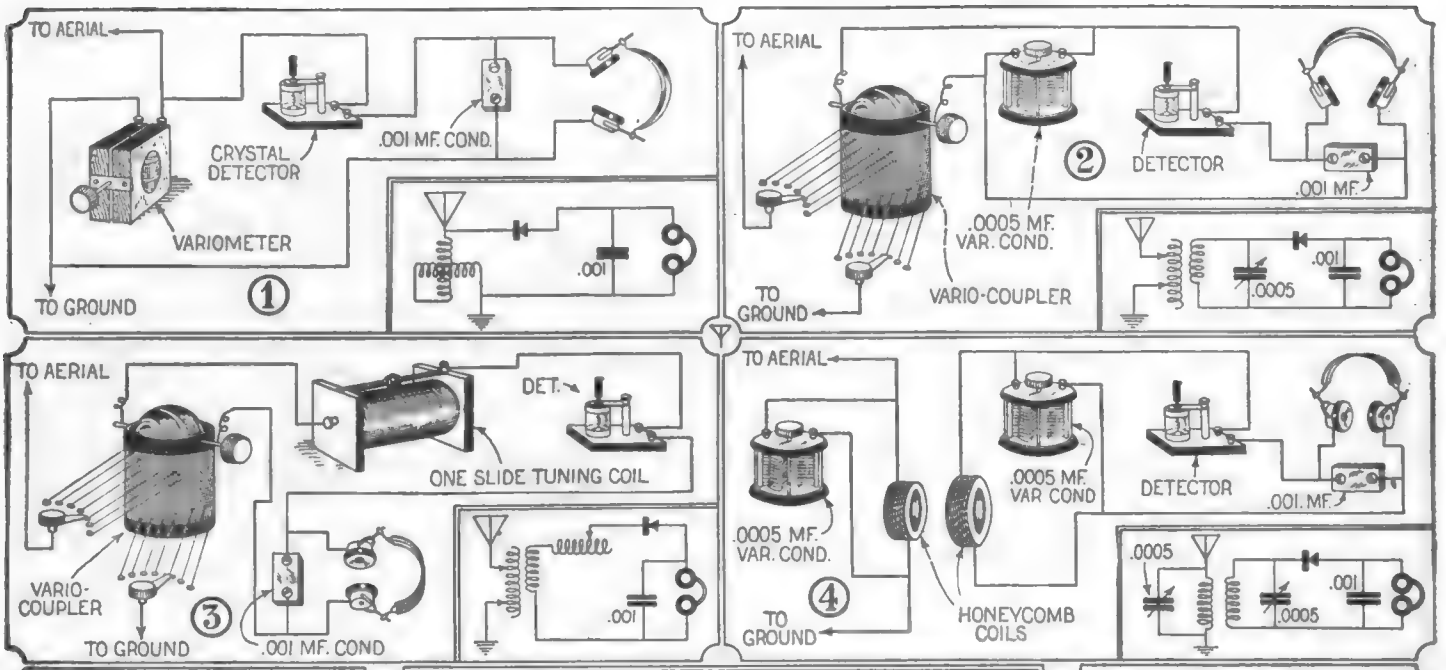
The photograph directly above shows one of the finest amateur radiophone stations ever constructed. It was made entirely by W. E. Schweitzer of Chicago and radio engineers having looked the set over proclaim it to be one of the finest amateur sets which they have ever seen. Mr. Schweitzer spends a considerable amount of his time on his radio set and is a master workman in that line. His receiver is one of the most selective and finely constructed pieces of apparatus which has ever come to our notice and rivals the best manufactured apparatus in appearance, while at the same time beating most of them as to efficiency. His transmitter, which was mostly constructed by himself, is a wonderfully efficient piece of apparatus and Mr. Schweitzer expects to furnish "listeners in" with some interesting material by radio. The photo shows an excellent view of both the receiver and the transmitter, the latter in the right foreground.

Many of our readers will no doubt remember the slot machine radio set described by H. Gernsback, the editor of this magazine in the September, 1922, issue of SCIENCE AND INVENTION. Many people at this time called this a dream and labeled it as impractical. However, the photograph at the right shows that the idea is by no means impractical as a slot machine radio set has been built and made its appearance for the first time in Washington, D. C. The photo at the right shows a little girl seated in the barber's chair listening in on the slot machine radio set while having her hair bobbed. It is only necessary for the listener to drop a nickel in the slot and select the station he or she desires to hear.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Efficient Crystal Receiving Sets

BY A. P. PECK, A.M.I.R.E.



VERY often we hear of crystal detectors receiving radio broadcast programs over distances of 1,000 miles or more. This is usually accomplished under extraordinary conditions and cannot be depended upon. However, the crystal detector, when operated properly and used with a selective tuner, will very often give astonishing results. The writer has personally received from stations 300 miles away using a crystal detector and a circuit similar to that shown in Fig. 2. This work was done very consistently during the fall. The crystal used was a piece of very sensitive galena selected from a pound of the commercial variety. The same work was also done with one of the many synthetic or manufactured crystals now offered for sale.

The diagrams given herewith have been carefully selected to give the best results with a minimum of apparatus. The circuit in Fig. 1 is the simplest of them all and with a standard variometer will give excellent results for local reception. It is not, however, very selective. The circuits in Figs. 2 and 3 are very similar, the secondary tuning being done in Fig. 2 with a variable condenser and with a one-slide tuner in Fig. 3.

$100 CRYSTAL DETECTOR CONTEST

THE editor has often mentioned that the use of the crystal detector is not as extended as it might be. For that reason SCIENCE AND INVENTION is offering $100 in prizes to check up on long distance crystal reception. In order to compete for a prize every entrant must have actually constructed and operated the crystal set which he enters and he must send us photographs, complete detailed data, hook-up, etc., on its construction. He must also send a statement, sworn before a Notary Public, putting forth exactly what long distance stations he has received. At least one witness who has also "listened in" must swear to these facts before a Notary Public as well.

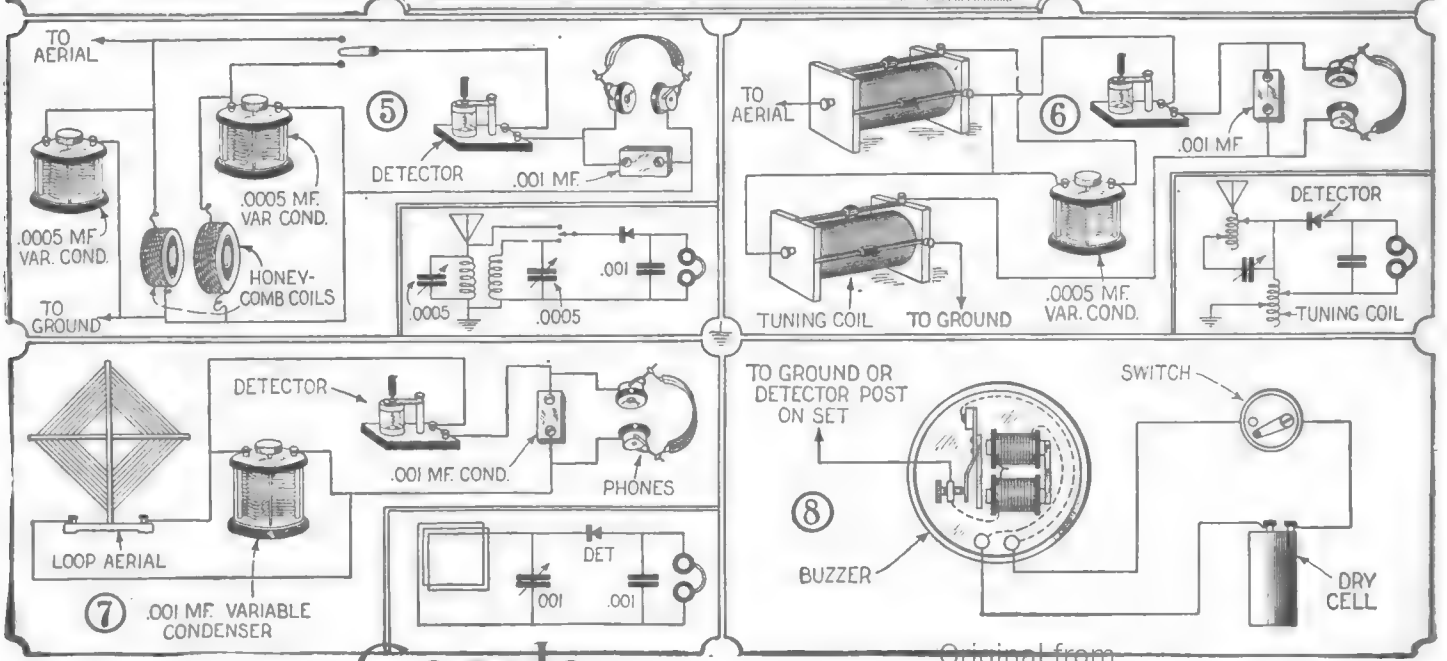
To be considered in this contest the crystal set must embody some new and unusual feature or otherwise contain a type of instrument not heretofore used. Any crystal, natural or synthetic, or any combination may be used. All entries for this contest must reach the editor by 5 o'clock, June 5th, 1924. The prizes will be announced in the August issue. Entries cannot be considered if penciled or that do not comply with the rules. Typewrite or write the description and make all sketches in ink. Should two contestants submit the same winning idea, a like prize will be awarded to both.

Address all correspondence to Editor, DX CRYSTAL DETECTOR CONTEST, care of this publication, 53 Park Place, N. Y. City

THE PRIZES WILL BE:

First Prize	$50.00 in gold
Second Prize	20.00 " "
Third Prize	15.00 " "
Fourth Prize	10.00 " "
Fifth Prize	5.00 " "

Many amateurs are firm exponents of the use of honeycomb coils and, therefore, we show the circuit diagram in Fig. 4 employing these highly efficient coils. Note that small variable condensers are used, being shunted across the two coils. This gives sharp tuning. The sizes of the coils used must be determined by experiment. A variation of the circuit given in Fig. 4 is shown in Fig. 5. The two point switch is added so that for local reception and to obtain slightly louder signals, a single tuned circuit may be used. For selectivity and distance work the switch blade should be placed on the lower point. In radio operator's parlance this is known as a "stand-by and tune" circuit. A combination wave-trap and tuning circuit making use of two standard two slide tuners is illustrated in Fig. 6. For reception from stations located not more than two or three miles away, a loop aerial may be used being connected as illustrated in Fig. 7. The loop should be as large as possible so as to pick up the greatest amount of energy. A buzzer test is a great help in crystal reception both for adjusting and bringing signals that seem to fade. The circuit of a buzzer test is shown in Fig. 8.



Digitized by Google
Original from UNIVERSITY OF CHICAGO

Four Experimental Circuits

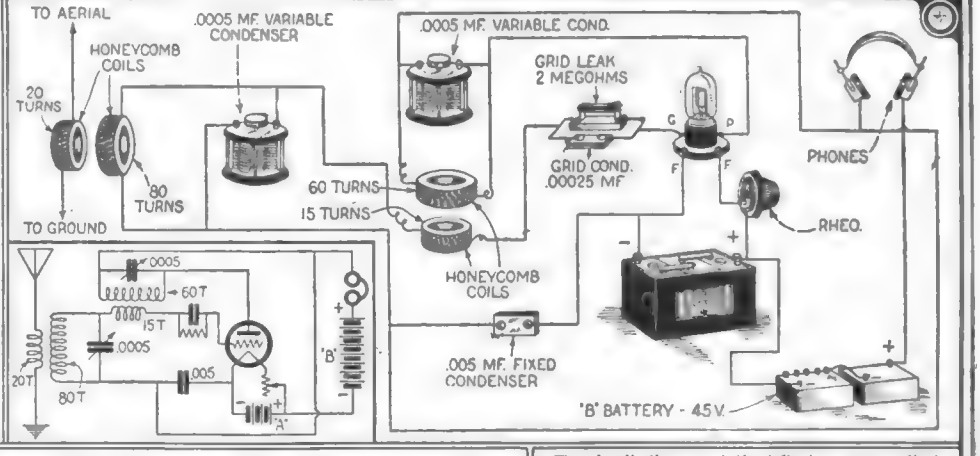
Circuits Using Only One Tube Which Give Excellent Results

By FOUR EXPERIMENTERS

At the right is shown a circuit diagram of a single tube receiving set which if handled correctly will give very little radiation. The designer of this set put it into use after having used a standard three circuit tuner for some length of time. He found the set illustrated to be better, being more selective and sensitive and having only three controls. In our circuit diagram we have shown honeycomb coils and these may be used and placed in inductive relation to each other if desired, or the following data may be employed. The 20 turn coil may be wound with No. 22 wire on a 2¾-inch tube. The 80 turn coil should then be wound with the same size of wire on a three-inch tube, in the same direction as the 20 turn coil and placed within the 3-inch tube. The same construction applies to the 60 and 15 turn coils, the former being wound on a 3-inch tube and the latter on a 2¾-inch tube. D.C.C. wire should be used throughout.

A standard soft tube may be used as a detector in this circuit or a UV-199 will be found to give very good results. If a tube of the UV-200 type is used, the "B" battery voltage should be approximately 22½.

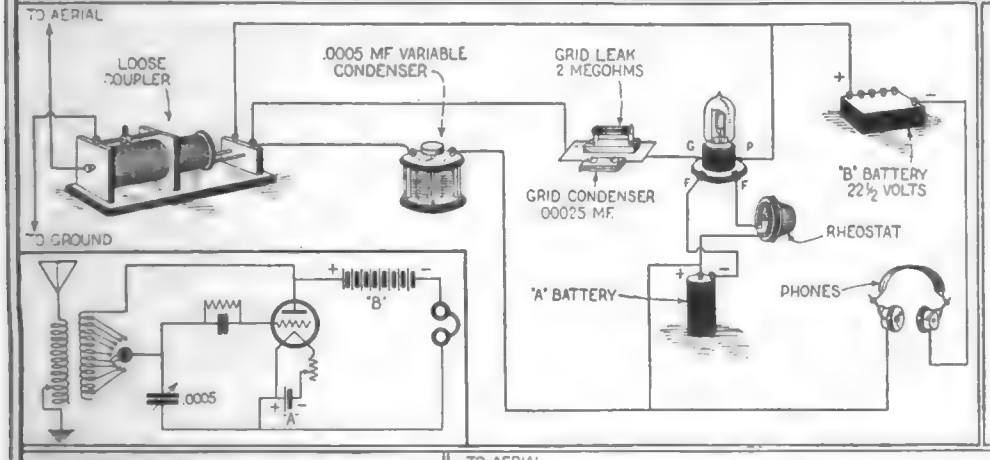
—L. Ringer.



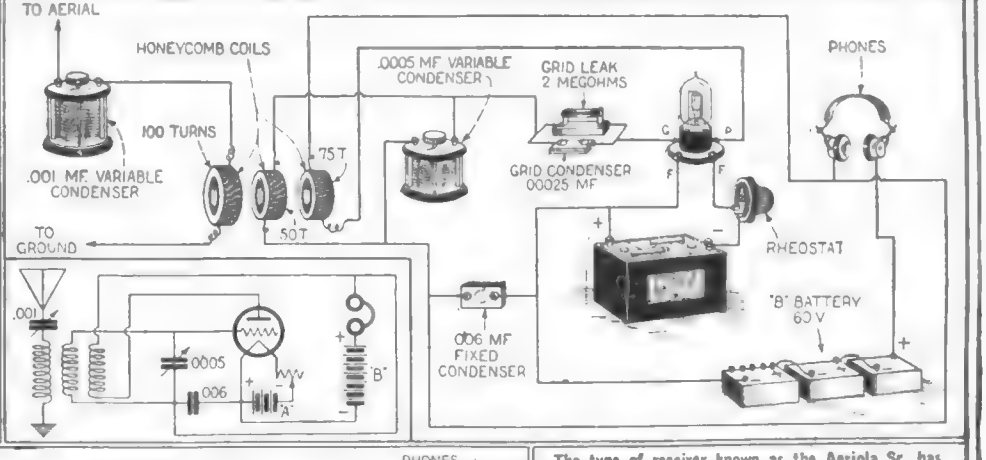
The circuit diagram at the left shows an excellent set for use with a standard type of loose coupler. If it is desired or if the builder happens to have one on hand, a vario-coupler can be used in place of the loose coupler, in which case a small variable condenser with a capacity of about .0005 mf. should be shunted across the rotor or secondary. This circuit as originally submitted to us used conductive coupling which would cause the set to radiate quite badly. The editor took the liberty of changing the circuit to an inductively coupled type which will reduce radiation considerably and keep this simple set within the limits placed by our fight against radiating regenerative circuits.

In this set, a soft detector tube may be used and any one of the standard types will give excellent results. The designer of the set used a WD-12 tube which only requires a single dry cell for operation and with the set in the original form, logged many stations throughout the country, from California to the eastern coast. This was done, using no audio frequency amplification, with the set located in a town in Illinois. The designer of the set is a real experimenter and after trying several other types of circuits has finally settled down to this one.

—William Hoercher.



An adaptation of the standard Flewelling circuit, but one which employs a standard three coil honeycomb set is illustrated at the right. If the reader happens to have a set of the type of coils mentioned in operation, the only change necessary to make the set into this improved Flewelling is to insert a .006 mf. fixed condenser as shown and make the connection from one side of this condenser to the plate circuit. The diagrams at the right show the connections of this set in both perspective and schematic forms. The designer of this set said that when he was using it he had to employ for a while a bed spring as an antenna. Located in Illinois, he heard most of the large stations throughout the United States and several in Canada as well as Cuba. He has not as yet had a chance to try out this set on an out-door aerial, but the editor believes that very good success would be obtained with the same. The writer was able to receive from New York City with the ground alone, but then the set was too noisy. The volume when used with the bed spring aerial was all that could be desired from a single tube and many stations came in almost too loud to listen to with the receivers on the head. The set is rather critical in adjustment and a variable grid leak should be employed.

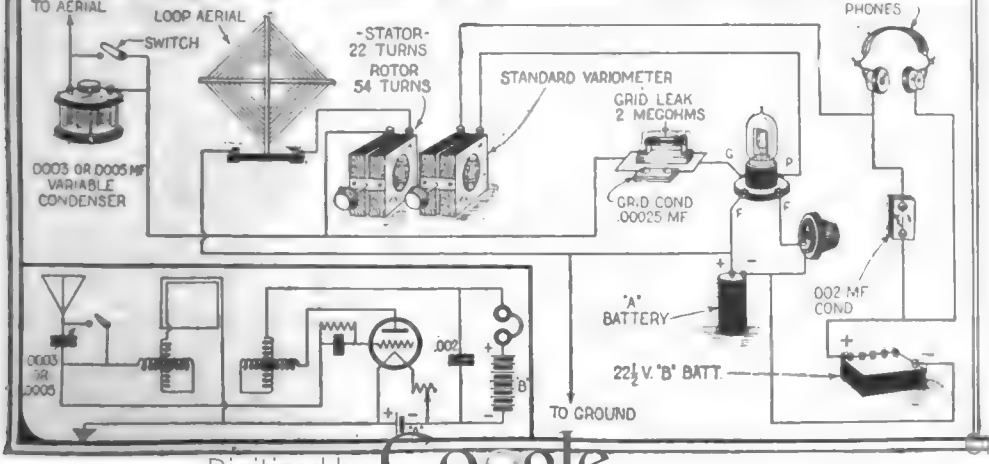


The type of receiver known as the Aeriola Sr. has been quite popular of late and many home-made sets have been made copying that particular outfit. The principle instruments are two variometers, and one of our readers during experimental work found that the addition of a loop aerial made quite a little difference in the reception. The circuit diagram as submitted by this writer is shown at the left. A series antenna condenser is used with a switch for short-circuiting it when a fairly short aerial is employed.

The variometer in the plate circuit of the detector tube is of the standard type and size while the other variometer is rewound to the specifications shown. The stator should have 22 turns of No. 22 D.C.C. wire, 11 on each side of the rotor shaft. The rotor should be wound with 54 turns of the same sized wire, 27 turns on each side of the shaft. The rotor and stator are connected in series. Great care should be taken in tuning this set in order to prevent radiation.

Capacities of from .001 to .003 mf. should be tried across the phones. The voltage of the "B" battery will depend upon the type of tube used and various voltages should be tried until the best results are arrived at.

—Garold W. Van Vlack.

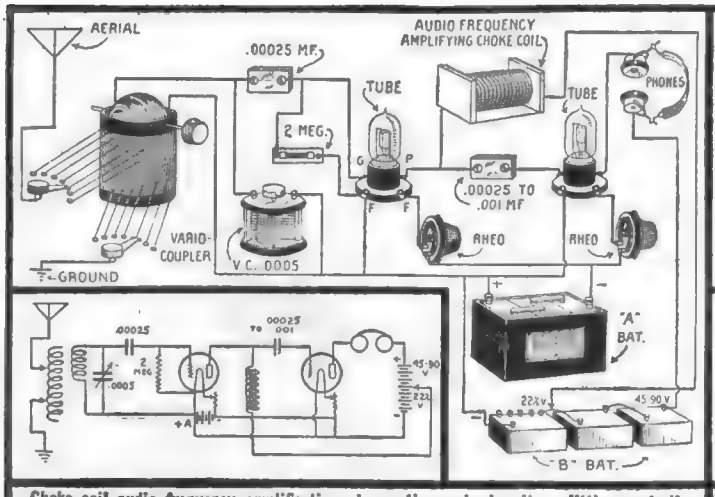


Digitized by Google
Original from UNIVERSITY OF CHICAGO

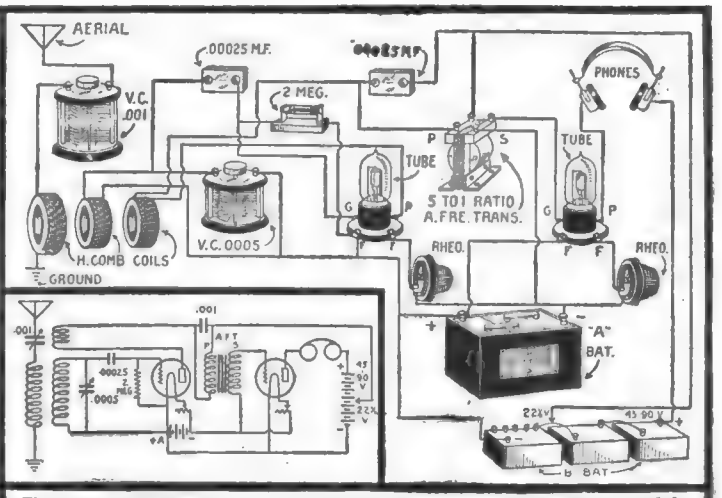
Radio for the Beginner

No. 25—Adding the Second Tube

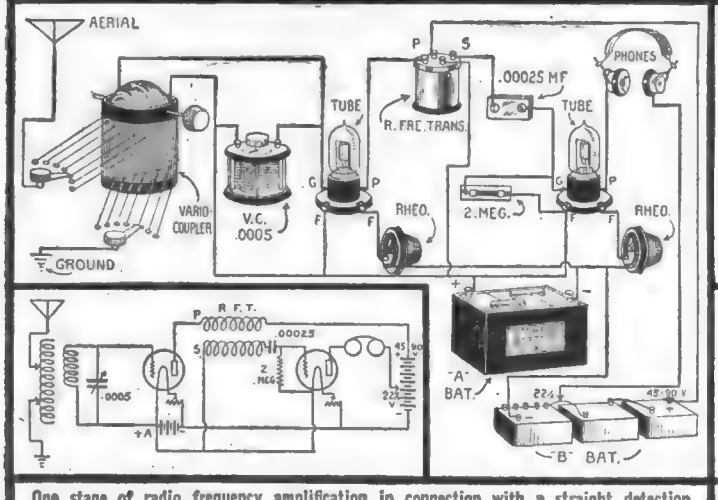
By ARMSTRONG PERRY



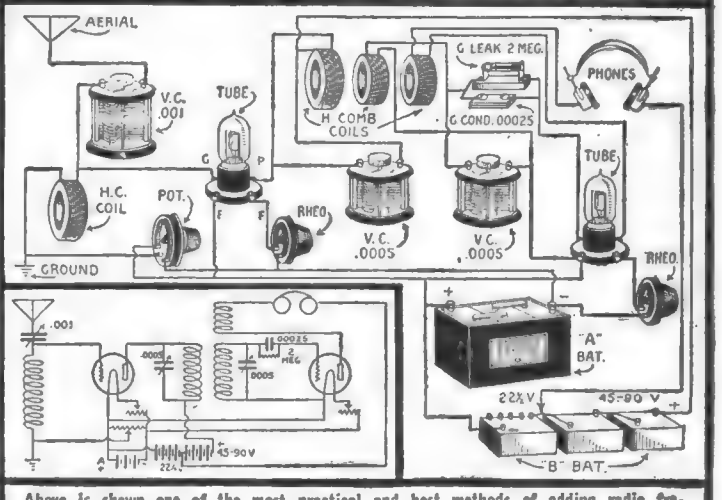
Choke coil audio frequency amplification at one time gained quite a little popularity because of the fact that, contrary to the case of transformer coupled amplifiers, practically as many stages could be used as desired without the usual attendant distortion. The volume delivered by a choke coil coupled amplifier is not quite as great as that from an equal number of stages of transformer coupled but there is less noise and distortion. The diagram above shows one stage of choke coupled amplification.



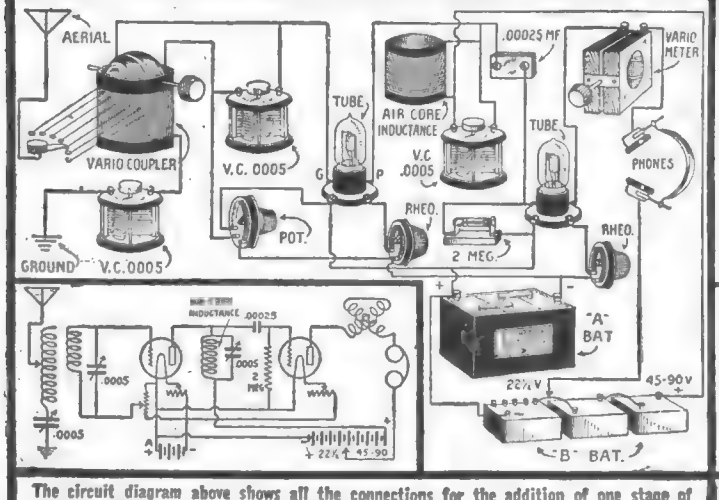
The diagram above shows how to add one stage of audio frequency, transformer coupled, amplification to a standard three coil honeycomb circuit. This same diagram, that is, the audio frequency amplifier can be adapted to any standard receiving set of any type whatsoever. The audio frequency amplifying transformer should be of a good make so as to give amplification as distortionless as possible. A three to one, five to one, or nine to one ratio audio frequency transformer may be used.



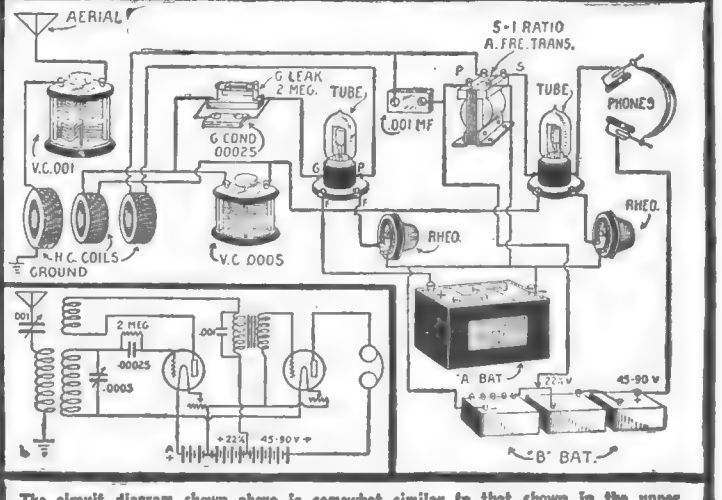
One stage of radio frequency amplification in connection with a straight detection circuit will give slightly better signals than a standard regenerative circuit. However, it has the great advantage of being non-radiating and at the same time the reception is much clearer and more distinct. A circuit diagram showing one stage of transformer coupled radio frequency amplification is given above. It is advisable to use an "A" battery potentiometer connected in the usual manner.



Above is shown one of the most practical and best methods of adding radio frequency amplification to a standard three honeycomb coil receiver. This addition puts an end to radiation from the regenerative circuit even though with such a tuner, radiation is quite low. The honeycomb coil used in the antenna circuit should be of the same size as was formerly used in the primary of the tuner when it was used without the radio frequency amplification.



The circuit diagram above shows all the connections for the addition of one stage of tuned impedance coupled radio frequency amplification to a set employing a vario-coupler, a variable condenser and a variometer. The detector circuit is regenerative and as a result the set will yield quite loud signals. Selectivity with a circuit of this type is very good. The air core inductance should consist of about 40 turns of No. 22 D. C. C. wire on a 3-inch tube.

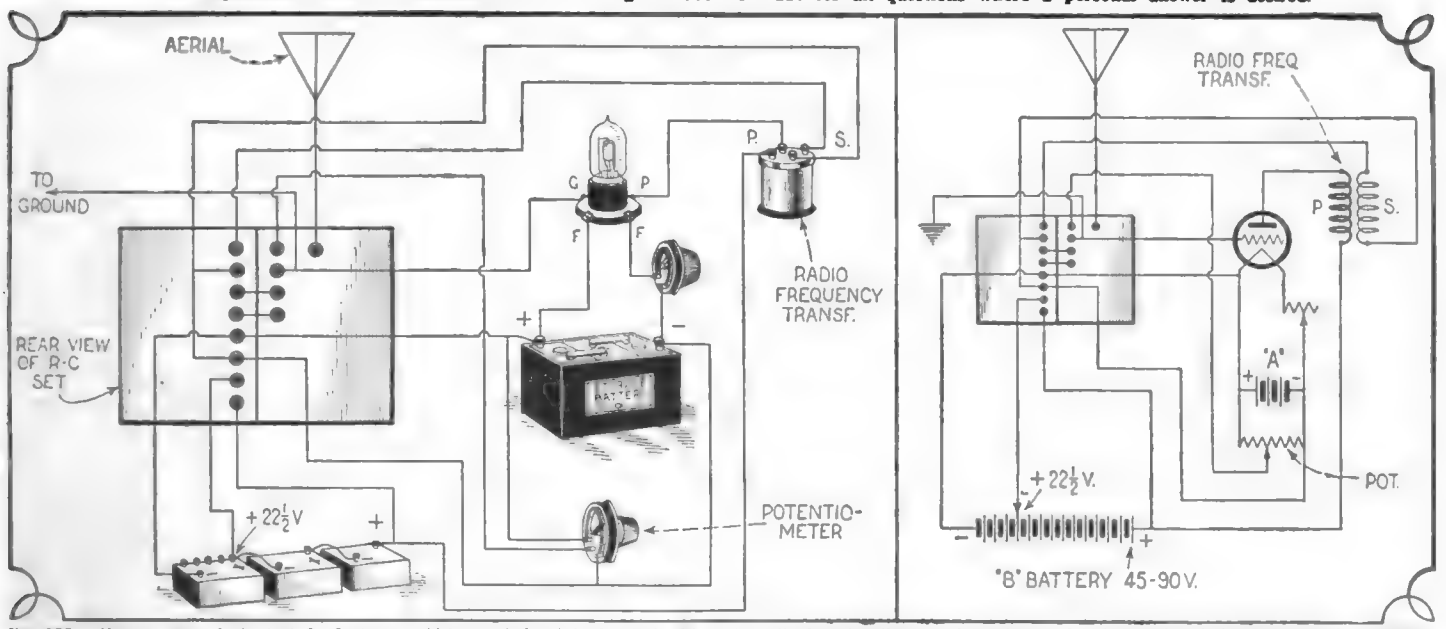


The circuit diagram shown above is somewhat similar to that shown in the upper right-hand corner of this page, but there are some changes here which may give the builder several suggestions toward making his set more efficient. It very often happens that a certain tube will operate better with the grid leak connected as shown above than it will with it connected from the grid to the filament. Also the tube may work better with the negative "B" battery connected to the negative "A."

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Radio Oracle

In this Department we publish questions and answers which we feel are of interest to the novice and amateur. Letters addressed to this Department cannot be answered free. A charge of 25c. is made for all questions where a personal answer is desired.



No. 250. Many owners of standard R. C. tuners which are designed to be used with a special detector and two stage audio frequency amplifier often desire to add radio frequency amplification to the same so as to increase the receiving range. This can be accomplished, placing the radio frequency amplification between the tuner and the detector by following the diagram given above. As shown, the tickler feed-back is retained, feeding back through the R. F. amplifier. If this is not desired, the jumpers shown may be removed and the binding posts on the detector, which formerly connected to the tickler, short-circuited. This will make a much quieter receiving set.

R. F. WITH R. C.

(250) Jim K. O'Neill, Alta., Canada, asks:

Q. 1. Can you give me a circuit diagram for adding one stage of radio frequency amplification to a standard R. C. tuner, detector and two stage amplifier without changing the internal connections of the same?

A. 1. Such a diagram is given in these columns. The view of the R. C. set shown indicates all of the binding posts mounted on the rear of the same. The same "B" battery and "A" battery are used for both the radio frequency amplifier and the set itself.

TROUBLE

(251) Edward B. Sperling, Chicago, Ill., says that he built a radio receiving set following the directions given in an article in this magazine and that when it was mounted on a plain base, he obtained excellent results. He goes on to say that after obtaining these results he decided to mount his set in a cabinet and proceeded to do so. After this work was done the set worked very poorly and only the most powerful nearby stations could be received. He asks:

Q. 1. Can you help me with my trouble?

A. 1. We regret very much to hear that you have had so much trouble with your five tube radio receiving set. It would seem, however, that you certainly must have made a mistake in your wiring or else in changing the instruments from an open base to a panel, you damaged the windings on some of them. We would suggest that you go over each individual instrument in the tuning and radio frequency circuits and test them carefully for open circuits and look them over to see that nothing is short-circuited.

If there are pigtails on any of your instruments, make sure that the insulation has not worn through and short-circuited. This would account for noise and also for the broadness of tuning. If your set is considerably noisier than before, we would suspect that there is a feed-back relationship between your various instruments. The antenna inductance coil should be kept at least six inches away from the vario-coupler and variometer. Also the radio frequency transformers should be placed so that their coils run at right angles to each other so that no interaction will take place.

We would advise you to investigate the above mentioned points and if you still do not get results, write us again, giving complete information on the results obtained.

MAGNESIUM "A" BATTERY

(252) Lewis J. Feinstein, Richmond, Va., asks:

Q. 1. Will the battery described on page 885 of the January, 1924, issue of SCIENCE AND INVENTION work as the "A" battery in a radio set?

A. 1. In connection with the battery you mention, we would say that it can very readily be used as an "A" battery on a radio set. It delivers a fairly constant current and is perfectly suitable for the work mentioned. Of course, when the battery is not in use, the rods must be removed from the solution, as otherwise their life would be shortened considerably and they would rapidly polarize. The size of the rods will depend upon the size of the other elements used, but in general, we would advise the use of a one-half inch magnesium rod of sufficient length to reach the solution. These rods can be purchased from any electrical supply house.

NOISE IN RADIO SET

(253) Charles Horn, New York City, asks:

Q. 1. Can you give me some help toward eliminating the noises in my detector and audio frequency amplifier?

A. 1. Use an "A" battery potentiometer across the filament battery and connect it to the negative "B" battery. Solder all leads. Place the transformers in such a position that no adjacent transformers have their windings parallel to each other. Shield the instruments by means of tinfoil or aluminum sheets placed in back of the panels, and ground these shields. Make sure that there are no loose connections in your transformers, sockets and other instruments. Be sure that the windings of the transformers are not loose on the cores. Keep all leads as short as possible, especially those from the plates of the tubes to the primaries of the amplifying transformers, and also the grid leak. You might also try shielding the transformers from each other by means of aluminum plates or tinfoil sheets and ground same.

200 ILLUSTRATIONS—100 ARTICLES

is the average of every issue of RADIO NEWS. We doubt if there is a radio magazine in print that can show the diversity of articles and illustrations that is found in this magazine.

But above all, it is the quality of the material that is of prime importance to the man interested in radio. RADIO NEWS appeals to all factions: the Scientist, the Amateur, the Experimenter, the Broadcast Listener, and the Manufacturer. Each will find articles written especially for him. Every issue of RADIO NEWS is a radio education by itself. Sold on 35,000 newsstands in the United States and in every international book store in every civilized country the world over.

IMPORTANT ARTICLES APPEARING IN THE MAY ISSUE OF RADIO NEWS

Radio Beacons Non-Directive and Directive.
By F. W. Dunmore.

The Production and Use of Ultra Short Wavelengths.
By Prof. René Mesny.

Some Recent Radio Developments.
By S. R. Winters.

Radio Television—The Mihaly Telehor Machine.
By Nicholas Langer.

Choosing and Installing a Receiving Set.
By Parker L. Worthington.

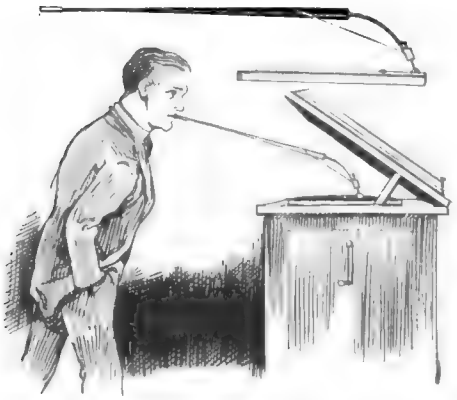
The Vacuum Tube and How it Works.
By Prof. John H. Morecroft.

Possibilities of Unique Receiving Circuits.
By Morris S. Strock.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

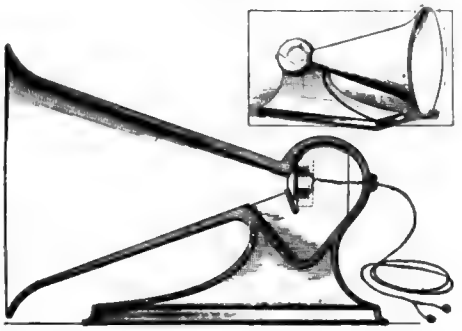
LATEST PATENTS

Dentiphone



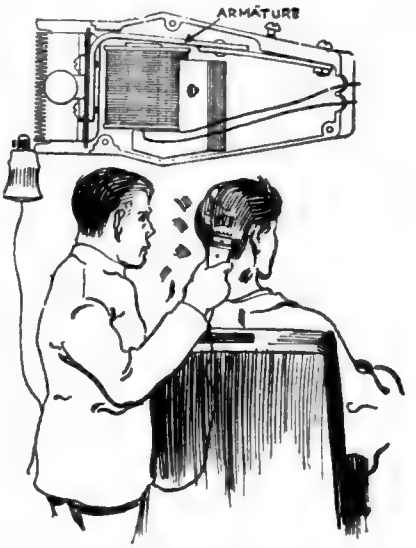
Pat. No. 1,472,214 issued to J. W. Gonce. By means of a phonograph stylus attached to a metal cone arm, connected with an extension, as shown in the above illustration, the inventor of this device communicates sound from the phonograph needle, to the mouthpiece of the extension, and to the user's ear. This invention is an aid to the deaf.

Loud Speaker



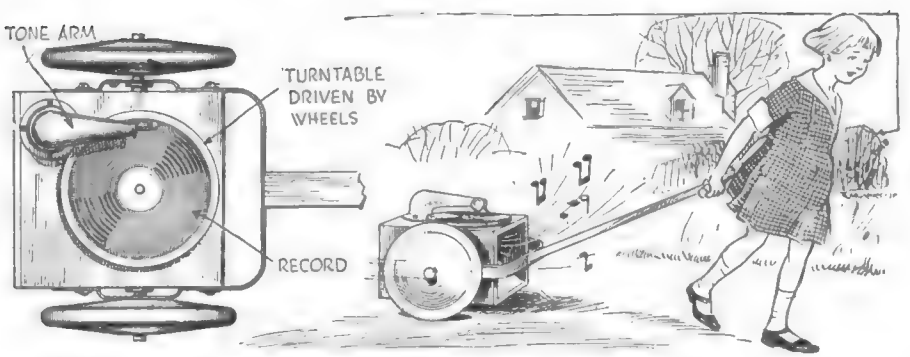
Pat. No. 1,483,159 granted to R. R. Williams and J. G. Malloy. In most loud speakers, according to the claims of the inventors of the above illustrated device, only one direction of the vibration of the diaphragm is used. This device contemplates using both the forward and backward spring of the diaphragm to originate sound waves. The horn is constructed in the fashion shown above. The electrical unit is mounted, as shown, and a hole is made through its rear casing, in order to allow a column of air extending backward to be actuated by the backward stroke of the diaphragm.

Vibrator Clippers



Pat. No. 1,474,128 issued to Leo J. Wahl. Most of the hair clippers on the market at the present time driven by electricity receive their motive power through a flexible shaft from a small motor. This flexible shaft results in a certain stiffness of movement and difficulty in operation. The above illustrated invention circumvents this defect by operating the movable blade of the electrical clipper directly from an iron armature which is acted upon by the magnetic field set up around the coil which receives its current through a flexible lead which may be plugged into any light socket. The clipper can be made to operate on either direct or alternating current, and is constructed so that any type of blade may be used.

Novel Phonograph Toy

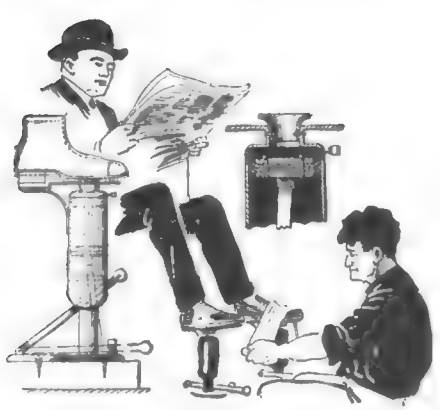


Pat. No. 1,484,965 issued tb Warren Ritter. By placing a toy phonograph—or rather a tone arm and a record turn-table on a toy wagon, this invention gives an exceedingly novel idea in the toy field. The rubber tired wheels connect to two friction disks within the body of the wagon, which in turn drive the shaft of the turn-table. The interior of the wagon is built in the form of a sound box, to which the vibrations from the diaphragm and tone arm are communicated. The turn-table is operated through the revolutions of the wheels as the wagon moves forward.

Egg Beater

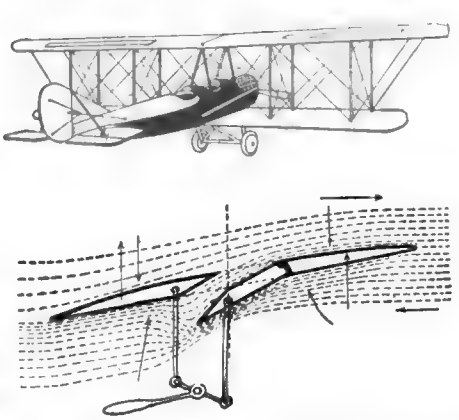
Pat. No. 1,477,943 issued to W. W. Crocker. As extremely valuable though simple improvement on the present-day domestic egg beater is the above shown invention. Instead of the usual crown gear, operating two smaller gears attached to the beating elements, this device consists merely of a spring with an extension arm which carries a rack operating a pinion attached to the beating element. Since this new beater can be operated with one hand, leaving the other one entirely free, it constitutes quite an improvement on the old style which necessitated the use of both hands.

Boot Black Stand



Pat. No. 1,463,631 issued to C. Schonsteiner and T. E. Michael. In order to obviate the discomfort resulting from a shoe slipping off the ordinary boot-black's stand, this invention places a suction cup in the bottom of a stand which is operated by a small piston contained in the stand. The suction acts upon the sole of the shoe being shined, holding it tightly to the foot rest.

Airplane Wings



Pat. No. 1,471,243 issued to H. L. Coffin. The inventor of the arrangement for airplane wings shown in the above illustration, claims that the air resistance of the machine is greatly reduced through the allowance of a flow of air through the central portion of the wing. By making it adjustable, the inventor also claims that maneuvering of the plane is made much easier.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Scientific Humor

AN ITALIAN "HOOK-UP"

From Marconi to Macaroni seems the trend of radio; first, we have the wire, and now we have the spaghetti.—*Ernest Macnew.*

HE USED HOT AIR

A man met an old friend who was a semi-invalid and had just returned from visiting a famous physician in another city.

"When you consulted the great specialist about your rheumatism did he prescribe hot baths?" he asked.

"No," replied the sick man, "he didn't soak me that way."—*Jas. J. O'Connell.*

THE LOUD SPEAKER

INTELLIGENT YOUNG SON TO FATHER: "Father, do you know that a device for eliminating sleep has been invented?"

FATHER: "Yes, son, we used to have one in our home when you were a baby."—*Lawrence G. Rowe.*

"STERLING" QUALITIES

SHE: "I've always wondered why poets speak of the moon as silver."

HE: "I guess it's because it's in quarters and halves."—*Milton Konecke.*

A COLD WAVE

HE: "You are the sunshine of my life."

SHE: "Oh Tom."

HE: "You reign alone in my heart."

SHE: "Darling."

HE: "With you at my side I could weather any storm."

SHE: "Just a minute Tom. Is this a proposal or a weather report?"—*F. O'Connell.*

A GREAT LIGHT DAWNED ON HIM

"People never take inventors seriously."

"No, even Edison made light of his theories."—*Fred Boelter.*

SHE HAD HIS NUMBER

He was a new arrival in this country and was none too familiar with the telephone, so he took the receiver and demanded:

"I vant to talk to me wife!"

Central's voice came back sweetly: "Number, please."

"Oh," he replied, perfectly willing to help out, "she bane my second wife!"—*W. W. Elmer, Jr.*

NO FREE GRAFT

SOPH: "I'll never be a horticulturist."

MORE: "Why the prejudice?"

SOPH: "I wouldn't want to risk being sent to jail."

MORE: "Where did you get that wild idea?"

SOPH: "Well, a horticulturist has to be a grafter, doesn't he?"—*Howard H. Smith.*

FOR THE "HEAVENLY" SEX

WIFEY (*reading*): "Hubby, what's the cosmic law?"

HUBBY: "Oh, that's the law of how to put cosmetics on."—*Francis Yraola.*

First Prize $3.00

CLEAR AS CRYSTAL

HE: "I have a crystal set in a match-box."

SHE: "Yes, I shouldn't wonder, I have a crystal set in a ring."—*Trevor B. Holow.*

AT DYNAMO'S

Oh, chemist of skill, investigate—
Answer this quiz of mine:
I think I know what Carbonate—
But where did Iodine?—*W. W. Elmer, Jr.*

OR DANDRUFF

TEACHER (*to class in physics*): "What force causes some people to scratch their heads when thinking?"

SMART LAD: "Force of habit, sir."—*David Bone.*

WE receive daily from one to two hundred contributions to this department. Of these only one or two are available. We desire to publish only scientific humor and all contributions should be original if possible. Do not copy jokes from old books or other publications as they have little or no chance here. By scientific humor we mean only such jokes as contain something of a scientific nature. Note our prize winners. Write each joke on a separate sheet and sign your name and address to it. Write only on one side of sheet. No letters acknowledged unless postage is included.

All jokes published here are paid for at the rate of one dollar each, besides the first prize of three dollars for the best jokes submitted each month. In the event that two people send in the same joke so as to "tie" for the prize, then the sum of three dollars in cash will be paid to each one.

HORSE SENSE

GRID: That storage battery booster of yours that I borrowed is one of the slow horse kind.

LEAK: What d'ye mean, "slow horse."

GRID: It isn't a fast charger.—*W. Derning Goodale, Jr.*

A GOOD ARRESTER

CHEMISTRY STUDENT: Professor, did you hear about that wonderful chemical change that occurred downtown yesterday?

CHEMISTRY PROFESSOR: No, what was it?

STUDENT: A policeman was talking to a friend, when a pretty girl in short dresses passed by and the "copper" turned to "rubber."—*Julian Warner.*

SHOCKING

JONES: "Who was the first man to be shocked?"

MASON: "Adam."

JONES: "How's that?"

MASON: "Well, wasn't Adam electrified when he saw Eve?"—*Manuel Cadima.*

THE DOC RE-TIRED—

"Hey, Bill, your doctor's out here with a flat tire, and he wants to know what it's going to cost him," announced the garage owner's assistant.

"Diagnose the case as flatulency of the perimeter, and charge him $8.00," came the answer.—*Harold Sachs.*

THIS JOKE HAS WHISKERS

RADIO BEGINNER: What do you get from the cat-whisker on your crystal set?

RADIO BUG: Why I get a meow every once in a while.—*J. M. Walukonis.*

THE LIGHTWEIGHT

PROFESSOR: "Why do we measure stellar space by light years?"

STUDENT: "Because there's no gravity in space."—*Andrew O'Connell.*

BAIT

STEW: What kind of fish has it's eyes set closest together?

DENT: Dunno, I'll bite. What kind does?

STEW: A little fish, of course, you sucker.—*Howard H. Smith.*

WHY MOTHER EXPLODED

MOTHER (*in next room*): Is the kettle boiling?

SON (*in kitchen*): No mother.

(10 minutes elapse)

MOTHER (*walks into kitchen*): I thought you said the kettle wasn't boiling, why it's almost boiled dry.

SON: No it hasn't boiled mother, but the water has.—*James T. Telling, Jr.*

GETTING PRACTICE

JACK: "Why did they kick that medical student out of the library?"

TOM: "They caught him trying to remove the appendix from a book he was reading."—*Paul K. Beemer.*

A WRONG "CALLING"

SMART: "How would you classify a telephone operator? Is her's a business or a profession?"

WEED: I'll bite, which is it?"

SMART: "Neither. It's a calling."—*John Agar.*

SHIFTING THE CENTER OF GRAVITY

PROFESSOR IN PHYSIOLOGY: What is the effect of alcohol upon the body?

PUPIL: It destroy's a man's stability and increases the tendency to translational and rotational motion by removing the center of equilibrium to a point outside the body.—*Edwin Berg.*

"STRIKES ME QUEER," SAID THE NAIL TO THE HAMMER

"Life for me is a perfect bore," said the auger.

"I'm a little board myself," said the plank.

"Regular grind," growled the stone.

The work bench said, "I have only one vise."

"Let's strike," remarked the hammer.—*A. Zimmerman.*

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Awards of $1000 Monthly Prizes

The Regular Departments Pay Prizes of Their Own. Authors on Contract Receive Their Own Rates; Making the Total Paid for Articles in Excess of $1500.00 Monthly.

FIRST PRIZE, $100

Tamar Lane 12-13

TWO PRIZES OF $50.00 EACH

Chevalier de Terrail 22
Dr. Albert Neuburger 25

TEN PRIZES OF $25.00 EACH

Clarence A. Snyder 15
Corley P. McDarment 15
H. H. Dunn 16
Ismar Ginsberg, B.Sc. 28
Phil Gersdorf 36
Angus Pekerson 36
O. F. Bond 38
Lt. Com. H. H. Little, U. S. N. 38
S. W. Ross 47
J. W. Von Stein 51

FIVE PRIZES OF $20.00 EACH

John Foley, Reporter 4335 35
W. W. Douglas 45
Don Home 46
C. A. Oldroyd 46
Armstrong Perry 56

TEN PRIZES OF $15.00 EACH

Leonard Bastin 16
Carl Bjork 34
E. A. K. Hackett 34
Edward H. Flaharty 45
Dr. E. Bade 47
P. Medinger 48
L. Ringer 55
Wm. Hoercher 55
C. S. Fish 55
Garold W. Van Vlack 55

TWENTY PRIZES OF $10.00 EACH

Author Art Removing Hair 35
Ernest H. Vuilleumier 37
S. Leonard Bastin 37
Ernest Jones 37
Don Home 49
Wm. H. Seitsinger 49
Robert R. Garner 49
J. T. Garver 86
H. R. Francis, Jr. 88
R. J. Harris 89
Harry Ackerson 90
Robert Lehfeldt 91
James Gordon 92
Leroy Western, Reporter No. 15 93
Harry Ackerson 93
Robert Lawrence 96
E. A. Lenz 97
Howard Fettes 98
C. B. Kramer, Sr., Reporter No. 6349 99
G. A. Luers 108

TEN PRIZES OF $5.00 EACH

Harold Jackson, Reporter No. 2903 47
L. B. Robbins 48
Thomas H. Duffy 48
W. E. Bramel 49
Willard Robinson 49
Dr. Albert Neuburger 49
C. R. Mullen 49
Dr. Albert Neuburger 49
Leroy Western 87
Wm. Henricks 92

TWENTY PRIZES OF $2.00 EACH

Leo Carble 87
E. S. Valentine 88
Noah J. Oak 90
Herbert I. Drew 91
Leroy Western, Reporter No. 15 94
Royal W. Knox 94
Francis N. Gilreath 94
Robert Clark 95
J. F. Bosmik 95
G. William Dayton 96
Harold B. White 97
F. J. Cartledge 98
A. Segoll 98
Author Radio Wrinkle Crystal Detector 99
Earle F. Rueter 99

(Balance—5 Prizes of $2.00—No Entries)

TEN PRIZES OF $1.00 EACH

(No Entries)

Here Is How You Can Get in the Contest:

$12,000 or More in Gold

EVERY month SCIENCE AND INVENTION pays $1,000 or more in gold in prizes. Every text article published will receive a prize—(most of the departments have awards of their own which they give every month). Ideas are what the Editors want. The ideas must be told simply, so that your mother or your sister can understand them—in pictures or sketches or both. But the idea must be new and must have something to do with science or invention.

The Editors want pictures and sketches—must have them—but what they want most is IDEAS. These ideas will be handsomely paid for. We have published a pamphlet showing the rules of the contest which we shall be glad to send to anyone free on receipt of a postal card with your name and address. The pamphlet gives full details the rules and how to submit articles. The magazine itself shows you what is wanted. Study it closely and submit your ideas.

The closing date for all prize contributions is the 15th of the month preceding date of issue, *i.e.*, the 15th of May for the July issue, the 15th of June for the August issue, etc.

88 monthly prizes will be given as follows:

FIRST PRIZE $100.00

2	PRIZES	of	$50.00 each
10	"	"	25.00 "
5	"	"	20.00 "
10	"	"	15.00 "
20	"	"	10.00 "
10	"	"	5.00 "
20	"	"	2.00 "
10	"	"	1.00 "

$12,000 or More in Gold

WILL YOU BE OUR REPORTER?

IN connection with our $12,000 prize contest announced herewith, it goes without saying that you will have to do a little work in order to win a prize. The Editors do not wish to make it hard for you, quite the contrary. We want pictures and ideas and we cannot have too many of them.

Herewith is reproduced our reporter's card. Up to now we have issued close to 10,000 of these. Note in our awards how our reporters are winning prizes right along. We shall be glad to send the reporter's card free to anyone who makes an application for it. By means of this card you will be able to secure entry into industrial plants, business houses, motion picture studios, steamships, docks, public buildings, etc. This reporter's card will prove an open sesame to you in many instances. Every card is numbered and only one is given to a correspondent. A postal card from you and a request for this reporter's card is all that is necessary to obtain one. It will be sent to you by return mail. With it we will send you a pamphlet giving rules of the contest and how to proceed in order to get photographs, to send in sketches, and other information in order to obtain a valuable prize. Not only will this card help you to obtain material for this magazine, but it will train you to become a news gatherer, and will be the means of helping you to earn a good deal of money during your spare hours.

Address Field Editor, SCIENCE AND INVENTION, 53 Park Place, New York

REPORTER

Science and Invention

CORRESPONDENT REPORTER'S IDENTIFICATION NO. 999

THE BEARER OF THIS CARD John Doe

IS AN AUTHORIZED CORRESPONDENT-REPORTER OF SCIENCE and INVENTION MAGAZINE

THE PUBLISHERS OF SCIENCE AND INVENTION WILL APPRECIATE ANY COURTESY EXTENDED THEIR REPRESENTATIVE.

EXPERIMENTER PUBLISHING CO.

(over) H. Gernsback PRESIDENT

Digitized by Google
Original from UNIVERSITY OF CHICAGO

THE ORACLE

The "Oracle" is for the sole benefit of all scientific students. Questions will be answered here for the benefit of all but only matter of sufficient interest will be published. Rules under which questions will be answered:

1. Only three questions can be submitted to be answered.
2. Only one side of sheet to be written on; matter must be typewritten or else written in ink, no penciled matter considered.
3. Sketches, diagrams, etc., must be on separate sheets. Questions addressed to the department cannot be answered by mail free of charge.
4. If a quick answer is desired by mail, a nominal charge of 25 cents is made for each question. If the questions entail considerable research work or intricate calculations a special rate will be charged. Correspondents will be informed as to the fee before such questions are answered.

AVIATION MICROPHONES

(1661) Alvin Munes, Denver, Colo., asks:

Q. 1. How are the microphones used for communication between the pilot and the observer on an airplane constructed?

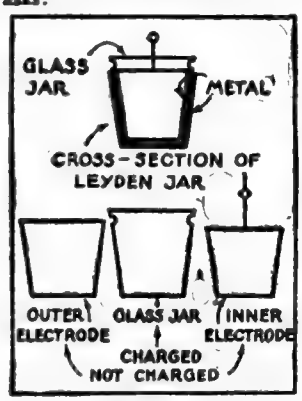
A. 1. The microphones used by aviators for communication between the pilot and the observer are usually of the standard type using carbon balls. These transmitters are strapped to the chests of the operators and when they speak the chest vibrations are transmitted through the microphones to the listener. In this way the sound in the motor does not affect the microphones.

Q. 2. When speech is transmitted by radio, are the vibrations for a certain sound faster or slower than when the words are transmitted to the hearer through the atmosphere in the ordinary manner?

A. 2. The vibrations of the human voice for sounds remain constant no matter how they are transmitted.

LEYDEN JAR PRINCIPLE

(1662) George Englewood, Nashville, Tenn., asks:



Contrary to the popular opinion the charge in a condenser or Leyden jar does not reside on the metal plates but on the dielectric. This can be readily proven by means of the experimental condenser illustrated at the left and described in the text.

Q. 1. When a Leyden jar is charged, where does the electricity accumulate?

A. 1. The charge in a Leyden jar resides, not on the metal electrodes but on the glass dielectric. This can be readily proven by means of a jar constructed on the lines shown herewith. Two metal cups are employed and placed together with a glass jar between them. A rod and ball are connected to the center electrode. The jar is then charged. By means of insulated hooks, the three elements are separated. By means of an electroscope it can be determined that the metal parts retain no charge. Upon approaching the glass portion with the indicating device, however, the presence of an electrical charge will at once be noted.

LOCATING BURIED TREASURES

(1663) W. Jackson, Wichita, Kansas, asks:

Q. 1. Can you give me any information on the apparatus used for locating metallic ores buried below the surface of the earth?

A. 1. There have been many devices made to locate metals and mineral ores buried beneath the surface of the earth. At least, so their makers claim. One of these devices working on the principle of the Hughes balance was described in the August, 1921, issue of this magazine.

TUNED STRING

(1664) Jos. W. Jackson, Brooklyn, N. Y., says that one day while he was tuning a musical instrument by matching two different strings, he noticed that when their tones were matched, the vibrating of one would cause the other one to vibrate also. He asks:

Q. 1. Can you explain this?

A. 1. The phenomenon you mention is that of sympathetic vibration. When a tuned string is plucked so that it vibrates, it sets the atmosphere in motion, the waves that it produces having a definite length. These lengths are determined by the various characteristics of the string. If another string is tuned so that when it is plucked it will give out the same wave-length, you will find that it will vibrate when the first string is sounded even though the second one is not touched. This motion is imparted to the second string by the moving air waves.

Valuable Articles in May "Practical Electrics"

High Tension Condensers. By Curtis Kissel.
Electric Oil Feed for House Furnace. By George G. McVicker.
Some Primary Batteries.
Building a Thermogalvanometer. By Dr. Russell G. Harris.
Battery Charging Switchboard. By Amedeo Giolitto.
Efficient Electrophorus and Electroscope. By R. G. Morgan
Tesla Coil. By Horace Brooks.
Experimental Microphone. By Frank W. Godsey, Jr.
Illumination. By Henry Harrison.
Novel Frictional Electric Machine. By F. E. Andrews.

REFRACTION OF LIGHT

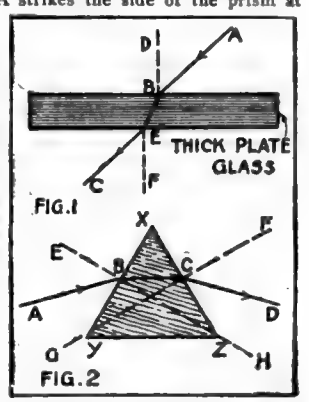
(1665) John J. Ross, Schenectady, N. Y., asks:

Q. 1. Can you show by a diagram how light is refracted in thick plate glass and also in a prism?

A. 1. In both cases the refraction or bending of the rays acts in accordance with the well known law put forth by Snell, a Dutch physicist, which is, "When a pencil of light passes obliquely from a less highly to a more refractive medium it is bent toward the normal; when it passes in the reverse direction, it is bent from the normal." Our illustration herewith shows just what happens when a light ray passes through heavy glass and through a prism. Fig. 1 represents a ray of light passing through plate glass. In this part of the illustration, A indicates the incoming or incident ray of light. B is the point where it strikes the glass and bends toward the normal which is indicated by the dotted line BD. The light then passes from B to E and is refracted away from the normal as it leaves the plate glass and enters the air. Its path is then represented by the line EC, normal being indicated by the dotted line EF.

In the case of the prism, which is illustrated in Fig. 2, the ray A strikes the side of the prism at

When light passes from a less highly to a more refractive medium such as from air to glass, the ray is bent toward the normal and vice versa. The exact phenomena which takes place both in thick plate glass and in a prism is shown at the right.



B, is refracted toward the normal EH, passes through the prism from B to C, leaves the higher refractive medium—the glass—and is bent away from the normal toward D. The normal in this case is represented by the light FG.

In connection with this discussion on light, the editor would like to make a correction on an item appearing in this department in the January issue. There it was stated that the angles of incidence and reflection were formed between the incoming and outgoing beams and the mirror. In this case, however, there should have been a perpendicular line drawn from the mirror and the angles of incidence and reflection shown as being between this line and the incoming and reflected rays.

OUR $12,000 PRIZE CONTEST

IT will be noted from recent issues and the present one that our prize contest has been a whale of a success. Over $1,000 has been paid out this month for worth while contributions to SCIENCE AND INVENTION, either in pictures, suggestions, ideas or articles. We now have on our staff, close to 9,000 correspondent reporters who are scouting the world for new material that can be written up for SCIENCE AND INVENTION. And the formula is simple—just keep your eyes open. Even if you were totally deaf or blind, you could still win a prize by simply using your head and sending us ideas of a scientific nature, or of a nature directly or indirectly attached to new inventions.

INTERESTING ARTICLES TO APPEAR IN JUNE ISSUE OF "SCIENCE AND INVENTION"

Giants in Teacups. By Ernest Brennecke
Balloon Tires—Their Advantages and Disadvantages. By W. B. Arvin
How Your Lodge Button Is Made. By L. B. Robbins
Raising the Ancient Obelisks.
Timing Cannons Electrically. By Raymond B. Wailes
Radio Desks—How to Build Four Attractive Models. By Wm. Butterfield
A New Universe. By Charles T. Dahama
Remarkable Minerals and Strange Crystals. By O. Ivan Lee, B. Sc., F.M.S.A.
Building Huge Movie Scenes with Paint and Brush. By Tamar Lane
Breathing Tests Make Labor More Efficient. By Dr. Alfred Gradenwitz
How Ball Bearings Are Made. By George Holmes

FREE INFORMATION

IF you want additional information concerning any of the subjects illustrated and described in this number of SCIENCE AND INVENTION we shall be glad to give you other data we have at our command. To make this work as easy as possible for our editors, please be brief. Write only on one side of the paper and state exactly in a few words just what it is you desire further information on. We have the original manuscripts and drawings of many of these articles in our files and can furnish much additional data in most cases. Please do not fail to send stamped and self-addressed envelope.

Address all inquiries of this nature to INFORMATION EDITOR c/o Science and Invention, 53 Park Place, New York City.

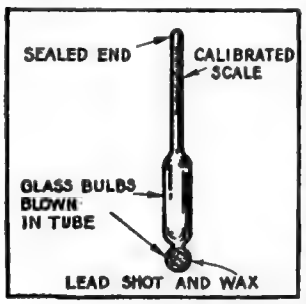
Digitized by Google
Original from UNIVERSITY OF CHICAGO

HYDROMETER CONSTRUCTION

(1666) Robert M. Lundy, Chicago, Ill., asks:

Q. 1. What is the construction of a floating hydrometer and how does it operate?

A. 1. The diagram herewith shows the construction of such a hydrometer. The lower end of it, as will be seen, is weighted so that when it is placed in a container filled with a liquid, it will float upright if lighter than the liquid. A scale is provided so that the distance to which the float sinks can be determined. This varies in different liquids, water being a standard, being assigned a specific gravity of 1 at 60° Fahrenheit. This figure is taken as standard and the specific gravity or density of other liquids is referred thereto.



The illustration at the left shows the construction of a standard hydrometer. This little instrument is usually placed within a syringe, the tubular part of the latter being constructed of glass and large enough to allow the float plenty of room.

VIBRATIONS

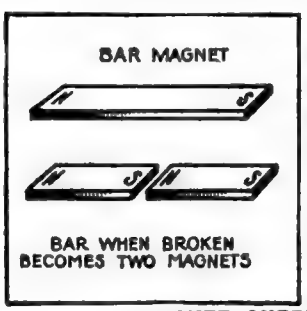
(1667) Richard F. Mooney, Tulsa, Okla., asks:

Q. 1. Can you give a table of various frequencies of vibrations from the slowest to the fastest, indicating which bands cover sound, electricity, heat, etc.?

A. 1. The table below gives the desired information.

TABLE OF VIBRATIONS

Octave	Number of Vibrations per Second	
1st	2	
2nd	4	
3rd	8	
4th	16	Sound
5th	32	
6th	64	
7th	128	
8th	256	
9th	512	
10th	1,024	
15th	32,768	
20th	1,047,576	Unknown
25th	33,554,432	Electricity
30th	1,073,741,824	
35th	34,359,738,368	
40th	1,099,511,627,776	Unknown
45th	35,184,372,088,832	
46th	70,368,744,177,644	Heat
47th	140,737,468,355,328	
48th	281,474,976,710,656	
49th	562,949,953,421,312	Light
50th	1,125,899,906,842,624	Chemical Rays
51st	2,251,799,813,685,248	Unknown
57th	144,115,118,075,855,872	
58th	288,230,376,151,711,744	X-Rays
59th	576,460,752,303,423,488	
60th	1,152,921,504,606,846,976	
61st	2,305,843,009,213,693,952	
62nd	4,611,686,018,427,387,904	Unknown



One of the phenomena of magnetism may be observed by breaking or cutting a bar magnet into two or three pieces. Each piece will become a separate magnet as illustrated at the left, unless too much force is used in breaking the magnet or too much heat is applied.

MAGNET QUERY

(1668) Timothy Sanderson, Brooklyn, New York, wants to know:

Q. 1. If a permanent bar magnet is broken into two or more pieces, what becomes of the magnetism?

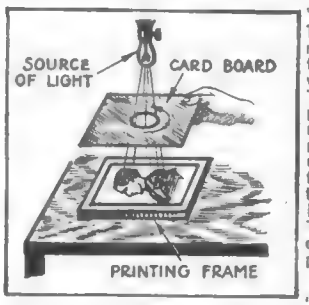
A. 1. In cases such as mentioned above, two or more permanent magnets will be formed, each having both a north and south pole. This is illustrated herewith.

VIGNETTING

(1669) Harold Brown, Pittsburgh, Penna., asks:

Q. 1. How can the vignetting process be carried on successfully in a small experimental way? I have several portraits on which I desire to use this process so as to obtain an effect of the head and part of the shoulders of the individual sharply defined, surrounded by a sort of a haze, fading off to white.

A. 1. Since you are doing your printing with an exposed lamp, the only apparatus necessary for vignetting is a cardboard sheet about one foot square with a small hole in it. This should be placed between the light and the plateholder as illustrated herewith. Some experimental work will have to be done to determine the exact size of the hole and the correct distance away from the plateholder. After the light is turned on, the cardboard is to be moved with a circular motion, keeping it the same distance from the plateholder. The radius of this circular motion should not be so great as to keep the main part of the direct light away from the central portion of the photograph to be printed. The knack of rotating the cardboard sheet can readily be learned. Upon development, it will be found that the desired "fading out" effect has been obtained.



To amateur photographers, the illustration at the left will be valuable. This shows a simple method of vignetting a photograph so as to produce a pleasing effect. It is particularly valuable in portrait work. The method of operation is explained fully in the text.

IMPORTANT

TO NEWSSTAND READERS

IN order to eliminate all waste and unsold copies it has become necessary to supply newsstand dealers only with the actual number of copies for which they have orders. This makes it advisable to place an order with your newsdealer, asking him to reserve a copy for you every month. Otherwise he will not be able to supply your copy. For your convenience, we are appending herewith a blank which we ask you to be good enough to fill in and hand to your newsdealer. He will then be in a position to supply copies to you regularly every month. If you are interested in receiving your copy every month, do not fail to sign this blank. It costs you nothing to do so.

....

To ..... Newsdealer

Address .....

Please reserve for me.....copies of SCIENCE & INVENTION every month until I notify you otherwise, and greatly oblige,

Name .....

Address .....

INCREASING ARC HEAT

(1670) William Goodwin, Peterboro, Ont., submits an idea for increasing the heat of an electric arc by having a hollow negative carbon and filling the same with water. The idea is that the water will be volatilized or separated into its component gases whereupon the hydrogen will be consumed in the arc and a greater heat will be produced. He asks:

Q. 1. Is this suggestion of any use?

A. 1. At no time during the operation of your arc will the water come to such a heat that it will decompose and separate into its component parts. You will not obtain any greater heat by the method you mention, in fact the negative electrode will be cooler than without the water supply. The water will rapidly pass off in steam.

If you wish to obtain a greater heat from the arc, we would advise you to experiment with various core substances, such as magnesium. The heat can be increased considerably by the use of some such material.

CLEANING MERCURY

(1671) A. Hewish, Winnipeg, Man., Canada, asks:

Q. 1. What is a good and simple method of cleaning mercury so as to free it from impurities such as dust and dirt which it has gathered?

A. 1. One of the best ways to clean mercury is to place it in a piece of chamois, draw up the edges so that the mercury lies in a hollow and grasping the edges of the chamois with one hand and pulling them together, twist the neck of the sack thus formed. Upon applying pressure, you will find that the mercury will work through the chamois in fine droplets, but the foreign substances will be retained.

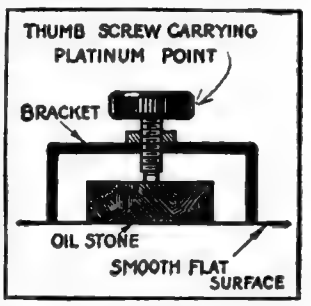
TRUING PLATINUM POINTS

(1672) E. Grimaldi, Ont., Canada, says that very often when replacing the vibrator on the spark coils used in a certain type of automobile, he finds that the contact points on the end of the adjusting screws are worn so that they do not make good contact with the new points on the springs. He asks:

Q. 1. Can you tell me how to true up these platinum points so that the surfaces between the two contacts can be made parallel?

A. 1. In order to do this work, the best method to follow is to construct a strong bracket in the shape shown in the diagram herewith, rounding off the edges of the ends of the legs so that the entire bracket can be moved back and forth on a smooth surface without too much friction. Drill a hole in the center of the bracket and tap it with the same thread as used on the contact screws. Place a flat oilstone on the surface on which the work is to be done and place the adjusting screw, the contact point of which is to be trued up, in the bracket as shown herewith. Move the bracket back and forth so that the platinum point will be trued up on the oilstone.

When platinum contact points on vibrators become worn and those on the vibrating spring are replaced, the stationary contact point must be straightened. This can readily be done by means of a bracket and an oil stone as illustrated at the right. The bracket must not bend.



GRAVITATIONAL ELECTRIC MACHINE

(1673) R. F. Hoster, Waynesville, N. C., puts forth an idea of a large machine similar to the armature of a large dynamo. He states that this machine is to be so situated that it will cut the gravitational lines of force and induce in the conductors an electric current which is to be collected by means of brushes resting on a commutator and used for any purpose. He asks:

Q. 1. Is this idea of any value?

A. 1. The machine you have designed would produce a slight amount of electricity by virtue of the lines of force surrounding the earth, but it would not prove very efficient, inasmuch as it would require an extremely large machine to give any noticeable voltage and amperage. The idea is very old.

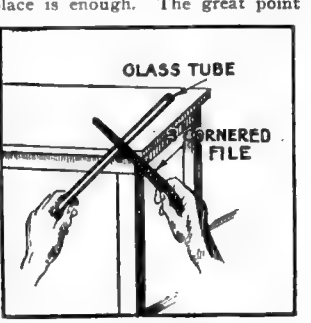
CUTTING GLASS TUBING

(1674) P. Edelman, St. Paul, Minn., says that he finds difficulty in cutting small glass tubing for use in chemical experiments and asks:

Q. 1. Can you tell me how to do this work without splitting the tubes or leaving ragged edges?

A. 1. First lay the tube to be cut on a table or stand as shown herewith and with a three-cornered file make a mark completely around the circumference of the tube at the point at which it is to be cut. The tube can then be readily broken by holding it with one hand on each side of the scratch, pulling it lengthwise and bringing lateral pressure to bear at that point. The edges of such a break will be found to be rather sharp, but they can be readily smoothed off by holding the end of the tubing in the flame of a Bunsen burner until it starts to soften. Remove immediately and the sharp edges will be found to have given place to smooth ones which will not cut the fingers or do other damage. Usually a slight scratch at one place is enough. The great point is to pull the glass like a string with some force and to put a slight bending or cross stress on it at the same time.

When glass tubing is to be cut, scratch it with a three cornered file at the correct point. Then take the tubing in both hands with the scratched point between the hand and apply pressure in the manner described in the text. This will usually result in a clean and even break.



CHARACTERISTIC OF A TUNGAR BULB

(1675) Edward L. Belle, Elizabeth, N. J., asks the Oracle:

Q. 1. What is the filament and plate voltage of a five ampere tungar rectifier bulb and how may a transformer be constructed for use with it?

A. 1. The filament voltage of a five ampere tungar bulb is two and one-half and the plate voltage from twenty-seven and one-half to thirty. See the March, 1923, issue of PRACTICAL ELECTRICS for full data on a tungar rectifier.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

"THE AIR IS FULL OF THINGS YOU SHOULDN'T MISS"

Get ready *now* for summer radio

YOUR radio batteries have served you well and faithfully over the long winter months. Now a great radio summer is at hand. To enjoy summer radio at its best, equip your receiver with the best batteries you can get. Put in new Eveready Radio "B" Batteries and see what wonderful, long-lived service they will give.

Made especially for radio use, Eveready "B" Batteries will operate the loud speaker at maximum volume for long or shorter periods, depending on how rapidly the current is taken out of them. Packed full of pep and punch and go, Eveready "B" Batteries pour out their power the moment you turn on the tubes. Scientifically made for long-lived radio service, the cells renew their vitality when idle—responding instantly with fresh vigor.

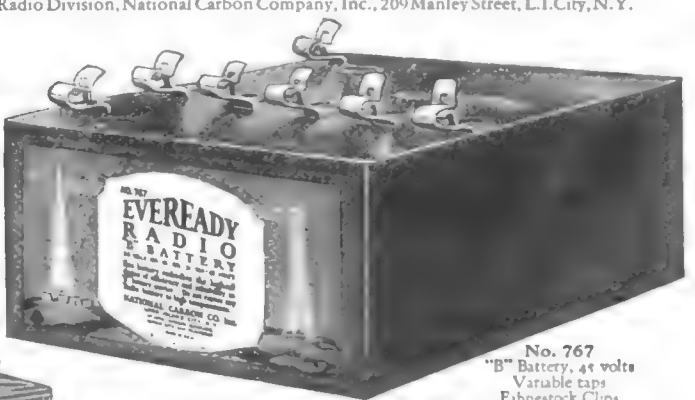
Eveready "B" No. 767 is the standard amplifier "B" Battery, and gives 45 powerful, dependable, zippy volts. Five sturdy Fahnestock Clips make this big "B" Battery available for soft detector tube use as well—varying the voltage from 16½ to 22½ as required.

Insist on Eveready "B" Batteries, remembering that they are the product of thirty years of experience and know-how in battery making. Designed and made under the supervision of the finest electro-chemical laboratory known to science, the quality and efficiency of Eveready Radio Batteries are assured. For maximum battery economy and service, buy Eveready Radio Batteries—they last longer.

Manufactured and guaranteed by

NATIONAL CARBON COMPANY, INC.
Headquarters for Radio Battery Information
New York San Francisco
Canadian National Carbon Co., Limited
Factory and Offices: Toronto, Ontario

Informative and money-saving booklets on radio batteries sent free on request. If you have any questions regarding radio batteries, write to G.C. Furness, Manager, Radio Division, National Carbon Company, Inc., 209 Manley Street, L.I.City, N.Y.



No. 767
"B" Battery, 45 volts
Variable taps
Fahnestock Clips

Eveready
6-volt
Storage
"A"
Battery

No. 766
"B" Battery. 22½ volts. Six Fahnestock Spring Clips

No. 764
The Space Saver
Vertical
22½-volt
"B" Battery

Eveready
"A" Dry Cell
The best battery for use with dry cell tubes

No. 771
"C" Battery
Clarifies tone and prolongs "B" Battery life

EVEREADY
Radio Batteries
—they last longer

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Look Here!

I will make you a DRAFTING EXPERT!

If you're earning less than $100 a week, GO INTO DRAFTING! I guarantee to train you AT HOME the "JOB-WAY"—with actual Drafting Room jobs. Send for my free book, find out about the wonderful opportunities to earn **big money** in this easy, fascinating business. Drafting experts are close to the boss—are first in line of promotion for executive positions.

$200 to $400 a Month!

Common schooling all you need! I train you by my copyrighted "JOB-WAY" instruction. I cover every branch of Drafting by giving you actual JOBS to do. No books or useless theory to waste your time. My graduates are SUCCESSFUL—employers *PREFER* Coyne-trained Draftsmen. So I guarantee satisfaction or to refund every penny of your money!

FREE Experts' Drafting Outfits

"JOB-WAY" training makes you a DRAFTING EXPERT quick because you learn to do actual JOBS with the same instruments you will use when employed at a big salary. To encourage you to START RIGHT NOW, I will give you with my course this complete EXPERT'S outfit FREE. Coupon brings complete information.

LEARN AT HOME!

Thousands of big-salaried jobs all over the country looking for DRAFTING EXPERTS! Railroads, factories, builders, architects, ship yards, auto plants, Cities, Counties, States and the U. S. Government all calling for Drafting Experts, all waiting for you to take the big pay job. Mail coupon, get my free book. Let me tell you the rest of this story **personally.** Address

CHIEF DRAFTSMAN
COYNE SCHOOL OF DRAFTING
Dept. 536 1-9 S. Ashland Ave., Chicago

CHIEF DRAFTSMAN
COYNE SCHOOL OF DRAFTING
Dept. 536, 1-9 S. Ashland Ave., Chicago.

Without obligating me in any way please send me your book, "Drafting, the Foundation of Industry," absolutely free. Also complete information of your rapid home-study Drafting course, Free instruments and special offer.

Name .....

St. No. .....

City ..... State.....

The Man On the Meteor

By RAY CUMMINGS

(*Continued from page 21*)

But I did not heed him. That girl on the rock across the cave was still crouching there. The baleful gaze of her huge eyes was downward to the platform—and my heart leaped into my throat when suddenly I realized that she was staring, not at Og, but at Nona.

And then I saw her hand go to her grotesque green robe. It came back; her pincer held a very short gleaming spear—like a dagger.

The crowd was silent, hanging now on Og's words. Of all that throng, only I was watching that menacing figure on the ledge.

Abruptly the silence was split by a scream—the Maagog girl screaming as though at last her rage and jealousy had broken the bonds of her reason. I saw her dive, head downward—diving and swimming, with the blade extended—straight for Nona!

My own reason left me. I leaped forward, thrust back Caan and Atar who would have stopped me—and plunged from the ledge—plunged downward in a long, swimming dive toward the platform where my Nona sat bound and helpless!

II

Plunging head downward, it seemed as though the platform, with Og, Nona and the white old men upon it, was sliding swiftly upward at me. To one side, level with me, the Maagog girl was coming down also; we two formed the sides of a V, converging at Nona.

It all happened very quickly; no more than a few seconds went by as I made that downward plunge—yet during that time my head whirled with a thousand frightened thoughts. And one of them stood out predominant. The Maagog girl, in murderous frenzy, would reach Nona first; would stab her to death before I could intervene.

I was conscious that the crowd had fallen silent. Behind me, high overhead now, I heard Atar shouting. Soon the platform was close under me. The Maagog girl, too, was close—unswerving, seeming not to have seen me. A spear, thrown by someone in the crowd—a crude, heavy sort of spear—came up at me, but I avoided its ponderous flight.

Og in alarm, had slid away; the white old men were cowering. Nona's face was upturned to mine. I twisted sidewise, flung myself at the Maagog girl. Our bodies met; the impact threw us both down upon Nona. The Maagog girl screamed again, but her screams were almost lost in the shouts that now came from everywhere.

I was hardly aware of intercepting the blow of that dagger. It struck my forearm—seared me like a fire-brand. But then I caught the girl's wrist, twisted the weapon from her. She screamed again, screamed with baffled fury. The water around us was white with her struggles.

Atar was beside me! "Quick, Nemo! Nona is free! Nona, come!"

With his spear-edge, Atar had cut Nona's bonds. The Maagog girl was swimming away, still screaming. A figure came at me—a Maagog man, with Og prudently behind him. I plunged the girl's spear into the figure's bulging chest, and waved my spear at Og as the Maagog sank at our feet.

Overhead, Caan was poised in mid-water, shouting defiance at the frightened crowd. I turned. Nona was free! She was mounting upward toward Caan, with Atar covering her retreat.

"Nemo! Nemo!"

It was Nona's voice. Og was backing away, looking for a weapon with which to attack me, and shouting at the crowd to head me off. I mounted after Atar and Nona. Higher up, Caan was now fighting a Maagog who had risen to attack him. Then the Maagog's body slowly sank, with Caan's spear buried in it.

THE RETREAT

In another moment we were again on the ledge from whence we had come—and my Nona was safe with us! For a brief instant I held her in my arms.

But Caan was dragging us all back into the passageway. Below us the cave was in turmoil. Og had gathered around him a dozen or so who had weapons. They were coming up after us! Frightened groups surrounded the bodies of the two we had killed. One of the white old men had recovered himself and was bawling orders. And over it all the Maagog girl was laughing and screaming with hysterical triumph because Nona had escaped Og and was gone.

"Nemo! Come!"

Ahead of us lay the dark passageway with its barrier of coral. Beyond that, another length of passageway upward to the open Water of Wild Things.

We swam hurriedly forward, but my arm was still around my Nona. Soon we were in the coral barrier. Behind us, down the passageway, we would hear Og and the others shouting as they followed us.

We threaded our way through the coral, slowly, laboriously, as one would force a way through the thick frozen underbrush of your winter forests on Earth. But it was a shallow barrier—two hundred feet through, no more.

Again we were in the open passageway; and Og and his party were approaching the barrier from the other side. We hastened onward and upward. It was a short distance only, and we were at the mouth of the tunnel. The open Water of Wild Things loomed before us. Somewhere up there through that inky void was the entrance which would lead us into Marinoid waters.

Atar gripped me, as with Nona beside me I would have launched myself out of the tunnel-mouth. And I heard Caan's low exclamation of dismay. A light had leaped out of the blackness—a single huge light of green; and then, behind it, a myriad others. Like tiny green stars they dotted the void.

We had no time for conjecture. The darkness out there took shape—a sinuous, serpentine shape. The thing was coming toward us. Its huge head seemed to radiate green fire; the body and tail behind the head were black, but like barnacles, a thousand luminous parasites clung to it, and glowed.

We drew back, but not before the serpent had become aware of us. It turned over with a long, gliding undulation and came at the mouth of the passageway. But it came hastelessly, lazily, as though in its own good time to pick up this food that was offered. I caught a glimpse of opened jaws—fangs half the length of my body. And its breath, a fetid stench, seemed to precede it.

Trembling, we flung ourselves back down the dim tunnel. Ahead through the coral, the vague reflected radiance from the cave was visible. In the coral we could hear Og and his followers, calling to one another as they threaded their way through.

There was no choice. The narrow walls of the passageway hemmed us in; behind us, the serpent was gliding quietly forward. We swam back to the coral. A Maagog forced his way out, and instantly I drove my spear into him. He crumpled with a gasp, and sank in a heap with the spear impaling him from back to chest.

"Nemo!"

(*Continued on page 66*)

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Announcing the greatest recent contribution to Radio ~

R3

New Model

This instrument sets a new and higher standard of adaptability, refinement and economy of operation.

R3 *(New Model)*, with Volume Control - - - - - $35.00

M1 requiring no battery for its operation - - - - - 35.00

THE MAGNAVOX CO. OAKLAND, CALIF.
New York Office: 370 SEVENTH AVENUE
Canadian Distributors: Perkins Electric Limited, Toronto, Montreal, Winnipeg

MAGNAVOX
The Reproducer Supreme

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Shows Short Cut to Big-Pay Jobs in Electricity

Ask Wallace Rohrschneider! He knows! At 28, he became General Manager of the Hustisford (Wisconsin) Electric Light and Power Company. His training at School of Engineering made it possible, as he will tell you.

The great field of Electricity needs thousands of TRAINED MEN—men who **know** the ins and outs of this fascinating profession. Never better time to start than right now! Send quick for your copy of our fine new book "ELECTRICITY" and see for yourself. It will be sent FREE. It tells you how to break into the big jobs, in the branches listed below.

ELECTRICAL ENGINEERING
B.S. Degree in 3 Years

The top of the Profession. Electrical Engineers are the big men of this great field and are sought by the largest companies and paid fabulous salaries. Always a shortage of able men—the job seeks you! Our Engineers are making their marks everywhere. You will be trained by Nationally known Specialists and Engineers and can secure B. S. degree in 3 years.

ELECTROTECHNICS
1 to 2 Years

The Electrotechnician is the man who fits electricity to modern industry. He ranks between the Engineer and Electrician and earns big money. He occupies such positions as General Plant Superintendent, Director of Construction, Superintendent of Maintenance, Chief Draftsman, and like important jobs. Grade school diploma or equivalent admits you without examination. New Term opens every 6 weeks.

COMMERCIAL ELECTRICAL ENGINEERING
1 Short Year

The Trained Electrical Business Man. This training is most fascinating and is taken up by ambitious men who have a flare for getting big returns for their efforts without slaving at menial jobs. Especially suited to boys who have had high school education. A quick sure way to a big success.

PRACTICAL ELECTRICITY
3 Months or 6 Months

In this complete 6 months Electrical Course—8 hours daily—you learn house, factory and theatre wiring, testing and meter work, A.C. and D.C. Armature Winding and all necessary mathematics. There are also 3 months courses in A.C. and D.C. Armature Winding, or Special Course in Light and Motor Wiring and Testing. A very popular training.

AUTOMOTIVE ELECTRICAL ENGINEER
1 Short Year

Fits you to be a big, handsomely-paid man in the great motor industry. Big motor plants everywhere searching for Trained Automotive Electrical Engineers. Unlimited opportunity in this great new field. Such a man may go into business for himself, as well, and make a brilliant success. The most thorough, complete and authoritative training to be found anywhere.

AUTOMOTIVE ELECTRICIAN
3 Months

A short intensive course in starting, lighting and ignition work. Skills you to locate instantly all auto electrical troubles. Our laboratories equipped with ACTUAL SYSTEMS taken from all leading cars. You learn by doing. You can start right into big-pay on completion of course. Thousands of big jobs waiting in this field.

EARN WHILE YOU LEARN

We provide for a limited number of worthy young men, half-time jobs at good wages, and permanent positions with unlimited prospects to all duly qualified graduates. **Here is the opportunity of your life** to get a thorough, practical training, and earn your way while doing it.

MAIL THIS COUPON NOW!

School of Engineering of Milwaukee,
Dept. X302, 415 Marshall Street, Milwaukee, Wis.

Without any cost or obligation on my part, please send me at once, your big 72-page book on Electricity and special particulars about branch I have checked below.

[ ] **Electrical Engineering.** [ ] **Electrotechnics.** [ ] **Commercial Electrical Engineering.** [ ] **Practical Electricity.** [ ] **Automotive Electrical Engineer.** [ ] **Automotive Electrician.**

[ ] Also include particulars of your **"Earn While You Learn"** plan.

Name .....Age.....

Address .....

City .....State .....

Education .....

The Man on the Meteor

(*Continued from page 64*)

ANOTHER OPENING

I turned, and Nona pushed me to one side. A small black opening was there—an opening at right angles to the main tunnel. It was barely three feet wide and twice as high. Caan and Atar were already in it. Nona glided in, pulling me after her. We swam back a dozen feet and paused. The green head of the serpent was out there in the tunnel we had left; it loomed there a vivid spot of light, at the entrance to this narrow slit which sheltered us—a head too large to enter. It stayed there a moment, and then, as though yielding to the inevitable, it quietly withdrew.

But how far, we did not know. We were terrified and confused. Nona was trembling violently.

"We must go on," said Atar. "Not back there to that—thing."

Ahead of us this narrow, slit-like tunnel seemed to broaden. It was almost black, but not quite, for the mud itself was faintly radiant.

We pressed forward, around a turn to the left, then another to the right. The water in this confined space was foul; it hurt our breathing. We hastened, to get out to the open water as soon as possible. We hoped we would strike it some distance from the mouth of the other passageway—enough to be away from the monster.

How far we went I do not know. Occasionally the tunnel branched, but we always took the larger. We turned several times—ascending, then descending again.

At last a glow showed ahead. The open water, but with a monster on guard there! Our hearts sank.

Abruptly, around a sharp curve, the glow brightened. We slid forward, came to the end of the tunnel. From a tiny, shelf-like ledge, we stared down into the self same cave we had left so precipitately half an hour before! Still up near its ceiling, but now on its opposite side!

III

How can I make clear the dismay, the confusion that swept over us at this unexpected outcome to our supposedly successful escape? What could we do? Retrace our way back through the winding tunnel? There were many diverging passageways: we would lose ourselves hopelessly in this honeycombed mudbank. And before us was the cave, into which we could not venture without the practical certainty of capture.

Too bewildered to do otherwise, we crouched and stared down into the cave. It was less crowded now, but there were still a hundred or more Maagogs on its floor, and dispersed about its wall niches.

Across from us, almost at the same level, was that other ledge on which we had formerly perched. Behind it, its tunnel showed as a small circle of blackness. Perhaps we could swim across the cave unnoticed—get into that other, now familiar, passageway—then through the coral barrier and into the open water. . . To safety. . . . Unless the monster were still there. . .

Atar aroused me from these thoughts. He was pointing downward into the cave.

"Nemo. Caan. What is he doing there?"

On the platform, Og and three of the white old men were gathered. Around them, a small school of fishes was swimming. Ten or twenty fishes—short, squat things, two or three feet long, smooth, dull black skins, and with huge distended mouths. For all their size there was about them an aspect of extraordinary strength—their powerful squat build, the alertness of their movements.

My heart almost stopped with the sudden realization that these fishes—or were they fishes?—were not swimming aimlessly, but were waiting for Og's command! Like a pack of trained animals they circled about their master. Then Og called to them. They answered with full-throated, yelping cries! Fishes with voices, you exclaim? You need not be amazed. There are "shouting fishes" even in your own waters of Earth.

Og was bending over the shell where Nona had been bound. The rushes that had bound her and which Atar had cut, were still lying there. At Og's call these swimming creatures gathered around him eagerly. The sound of their voices—yelping, whining—was blood-curdling. Og was raising up the severed bonds—holding them out; and the fishes were smelling of them!

Then, in a pack they gathered; and Og, leading them, swam with them across the cave up near its ceiling to that other ledge from whence, with Nona, we had made our escape.

The black fishes entered the other passageway, with Og and half a dozen other Maagogs after them. As they swept down into it, their gruesome cries died away into the distance.

You, with your knowledge of similar things, will doubtless think it stupid of us to be puzzled at the meaning of all this—at its danger to us. Yet—we had no way of knowing. We stared at each other, relieved that these ugly black things which uncannily answered Og's commands, had disappeared.

"Nemo! You are hurt!" It was Nona, who now had noticed that my arm was bleeding where the Maagog girl's dagger had ripped it.

"Nothing," I said; and I wiped it against my robe.

We tried to plan what we should do. Could we cross the cave? The Maagog girl was still down there, near the platform, with eyes alert to everything around her—eyes that still smouldered with hate and jealous rage. No. To enter the cave would be to court almost certain discovery. We would have to retrace our way—find some other tunnel to lead us out into the open water.

We were starting back, had gone perhaps a hundred yards, when far ahead of us down the narrow passageway, we heard sounds. Yelps! Cries! Whines! Not human—the cries of those squat fishes with their huge slimy jaws!

Panic seized us. We darted back toward the cave. Then forward again, trying to find a side tunnel. But along here there was none.

The yelps grew louder; Og's voice mingled with them. And then, before we could decide in which direction to go, like a pack of eager hounds following a trail and come at last upon their quarry the black fishes swept down upon us. I tried to fight them off—tried to protect Nona. But they darted about me, under me, over me, and gripped me from every side. Teeth like needles, ripping, tearing at my flesh. . . Og's voice shouting a command. . . Caan screaming a warning at me. . . Then something heavy struck my head. Silence and blackness descended upon me.

IV

I recovered consciousness to find myself lying in a bed of mud in a dim, cave-like room. My first sensation was one of heat; the water I was breathing was hot, stifling. My head throbbed.

Nona, Caan and Atar were gathered over

(*Continued on page 68*)

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Library of Electrical Maintenance and Repair

5 practical how-to-do-it books for electrical maintenance and repair men

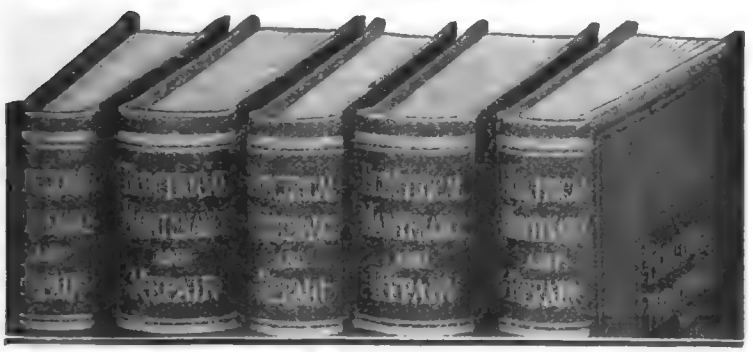
THESE five volumes contain the largest collection of practical methods for electrical repair and maintenance men ever put together in book form.
Every one of the books is jammed from cover to cover with good, sound, how-to-do-it information.
Every man concerned with the care and repair of electrical machinery should have this practical set.

Kinks, methods, plans, etc., that are as new as they are valuable

These books cover every phase of electrical maintenance and repair work, from armature winding to the correction of brush troubles. They include many things never before assembled in book form.

They not only tell you what to do in the case of electrical trouble, but they show you how to do it. And when it is done it will be right! The methods outlined for you by the authors of these books have all been thoroughly tested out in actual practice.

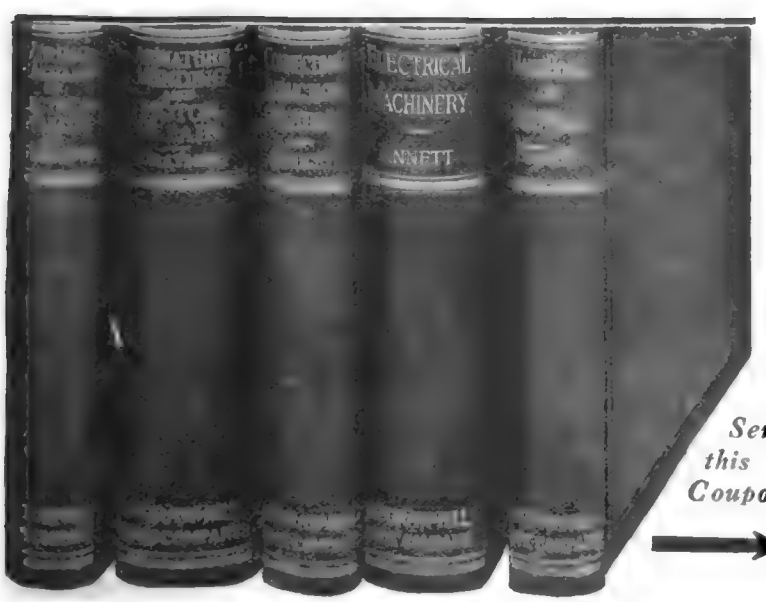
Every chapter is written with the practical man's needs in mind. Instead of discussing the fundamentals involved in any method of working out a repair problem, the ACTUAL PROBLEM is discussed from a how-to-do-it standpoint.



Seven good reasons why you should have these books

1. The five books in this library discuss actual repair jobs and show you step by step what to do when anything goes wrong.
2. They show you how to locate and remedy motor and generator troubles.
3. They show you how to re-connect motors to meet any condition of voltage, phase, frequency and speed.
4. They give you suggestions for preventing electrical machinery troubles.
5. They cover fully the rewinding of motors.
6. They tell you what to do to get better service out of your electrical equipment.
7. They give you tables, diagrams, data and kinks that you will find of priceless value every day on every job.

Examine these books for 10 days FREE!



Send this Coupon

Free examination Only $2 a month

You can secure the use of these great books on electrical repair work for ten days' free examination. When you have seen for yourself what these books are and how much they can help you, send us your first remittance of $2.00. The balance may be paid in monthly installments of $2.00 until the price of the library — $14.00 — is paid. Send for the books today. Fill in and mail the attached coupon.

Free Examination Coupon

McGraw-Hill Book Co., Inc.,
370 Seventh Ave.,
New York.

Gentlemen:—Send me the LIBRARY OF ELECTRICAL MAINTENANCE AND REPAIR (shipping charges prepaid), for 10 days' free examination. If satisfactory, I will send $2.00 in ten days and $2 per month until the special price of $14.00 has been paid. If not wanted, I will write you for return shipping instructions.

Name .....
Home Address .....
City and State .....
Employed by .....
(Fill in all lines.)
Occupation ..... S. & I.-5-24

McGRAW-HILL BOOK COMPANY, Inc.
370 Seventh Ave., New York

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Be An AUTO EXPERT
Make $75 to $200 A WEEK

Let me train you AT HOME to Boss the Job!

I WILL MAKE you a successful AUTO EXPERT, prepare you to go into business for yourself, train you for positions paying $3,000 to $10,000 a year! Keep your job—stay home—loan me a part of your spare time. As Directing Engineer of the Big CHICAGO AUTO SHOPS I train you the "JOB-WAY"—not with books.

B. W. COOKE
Directing Engineer
CHICAGO AUTO SHOPS

I Train You AT HOME!

My home-training makes Auto EXPERTS! I prepare you to BOSS THE JOB! My "Job-Way" instruction makes you MASTER of every branch of automotive work: Mechanical, Electrical, Battery, Taxicabs, Busses, Ignition, Farm Power Plants, Welding, Brazing, Vulcanizing, etc. You cannot get all this training anywhere else on earth.

FREE OUTFIT!
Big repair and testing outfit free to my students. Use it to do my JOBS, use it to make money, use it to make this training pay for itself!

FREE JOBS!
Employment department helps you get big pay jobs without one penny of cost!

Go Into Business!
—make $3,500 to $15,000 Yearly
Biggest opportunities to go into business with small capital when you have my training. Auto Experts run their own business and make $3,500 to $15,000 net profits a year. The same opportunity is open to YOU thru my guaranteed "Job-Way" instruction.

START NOW!
Inducements you cannot resist to help you START RIGHT NOW! Easy terms within your reach. One week's pay as AUTO EXPERT pays for my wonderful training. Let me tell you this wonder story personally. Mail coupon or address:

B. W. COOKE, Directing Engineer
CHICAGO AUTO SHOPS
Dept. 528
1553 W. Madison St., CHICAGO

AUTO BOOK FREE

B. W. COOKE, Directing Engineer
Dept. 528 1553 W. Madison St., CHICAGO
Please send me Free Book and complete information about your "Job-Way training at home." Tell me about the opportunities today for Auto Experts, how to secure FREE REPAIR OUTFIT.

Name.....
Address.....
City..... State.....
Occupation..... Age.....

The Man On the Meteor

(*Continued from page 66*)

me, waiting anxiously for me to recover my senses. Nona, hearing my weak voice, seeing my eyes open, threw herself down beside me.

I was not greatly injured. Og had struck me on the head with the flat of his spear. It had cut my scalp and raised an ugly lump. Besides that, the flesh of my legs, arms and shoulders was torn by those fishes' teeth as if by needles.

The plight of Caan, Atar, and even my dear Nona, was similar—but with none of us was it serious.

They told me now, that we were captives. Back there in the tunnel Og had called off his attacking fishes—called them from us or we would have been torn to ribbons. Then, floating me with them, the Maagogs under Og's direction had brought us here to this small room adjacent to the main cave—and left us.

I sat up, then swam a little. I was all right! Nona was all right—we were all safe and sound! My hopes revived. Why should we not now escape?

But none of my companions reflected my jubilant mood.

"Let him look around," said Caan to Atar. Never had I heard Caan speak so sourly, so despondently.

I did look around. We were in a black mud room some forty feet square and half as high. It was bare of furnishings; and lighted overhead by a crude sort of illuminated bladder that gave off a dull green glow. On one side against the black wall were beds, hollowed out of the mud. To *you* they would have looked like shallow graves; and in one of them I had been lying. Across the room was a shelf of mud with a dozen clay seats on it—like a row of huge toadstools.

NO ESCAPE

A third side gave into a tunnel. I approached it eagerly; then drew back shuddering. That pack of blood-hound fishes was out there, circling back and forth, on guard. They saw me, and darted lazily forward. As I stopped, they seemed satisfied, and went back to their endless circling, following every twist and turn of two or three who seemed to lead them.

Caan laughed cynically. "Not there, Nemo, you see."

My arms went protectingly about Nona, and she drew me wordlessly to the fourth side of the room. The wall here was gone. A grating of woven seaweed like prison bars, took its place. I stood on a precipice, gazing through the bars into a black void of water.

Can I make you understand the shuddering fear that possessed me? This water out there was moving swiftly downward, like a torrent, or a subterranean waterfall. Its current, drawing the water out of the room, flattened me involuntarily against the bars.

I had never seen swiftly moving water before. I felt as *you* would feel gazing from a great height into a dizzy abyss. And this water I could see, was boiling hot down there. But for those bars, I should have been whirled down into it! And from far below I could hear a faint sizzling, as of water dropped on a bed of embers.

I forced myself away from the grating, back into the center of the room; and now I was aware that all the water in the room was coming from the tunnel and passing in a current through those bars.

"You see," said Atar, trying to speak calmly. "You see now—"

But Og abruptly entered from the tunnel. He hovered before us, leering. Nona shrank against me, and I folded her in my arms.

Og did not glance at Nona. He said to Caan: "Have you decided?"

"No," Caan answered. "He is but this moment recovered. We——"

"Tell him now. I will wait." Og turned away, swam over to the grating and gazed through it to that boiling, tumbling water.

Then Caan told me. Og offered us freedom—us three men. He would send us back to Rax. The price of it was Nona's promise to be his Queen—a willing, smiling Queen, none other would the Maagogs have.

I could feel Nona shudder against me, but she said no word.

"No!" I shouted. "No! No!"

Og heard me and smiled. "There is another way. Tell him, Caan."

And if we did not agree—if Nona did not give her promise—Og, the Executioner, would open the grating and let us three men slip out—down into that boiling water our helpless bodies would be sucked. . .

As Caan said it, my Nona burst out: "And Nona, too. *That* is best."

But even that, Og heard. "No," he smiled. "Not Nona. She will stay here with me—to rule as Queen when I have coaxed the smiles back to her pretty face."

I was suddenly aware of another figure in the room. That Maagog girl had slipped in from the tunnel. She heard Og's words. Her face smouldered with fury; but it was Nona, not Og, at whom she gazed so balefully. And I knew then that if ever Nona were left with Og—if we men were killed—this woman would kill Nona if she could.

Og faced the girl.

"Well, Maaret? Why do you come here?" He addressed her gruffly. "Did I not tell you to stay away?"

She gestured behind her. "The time is on us. They are ready—coming now. And Og, I knew that you had forgotten."

Og grinned. "Yes girl, you speak well—I had forgotten." It was doubtless very amusing; he was chuckling as he whirled on us who were hovering in a huddled group. "A fortunate occurrence, my friends from Rax. You shall swim aside now—and watch me as I perform this little duty of mine. You shall see how cleverly, how gracefully I do it."

He was still grinning; his voice was ironical, mocking—but his eyes were gleaming at Nona. "It will help *you* to decide, my Queen—help you to choose the fate of your Nemo, your little toy Prince Atar, and your Caan the shell-gatherer!"

There were sounds in the tunnel now—a low wailing, monotonous, like a chant, a dirge. Og waved us imperiously away. Maaret, the Maagog girl, led us to the side of the room near the grating. We followed her, but I kept myself between her and Nona. And there, flattened against the mud wall, we watched and listened.

AN EXECUTION

The wailing swelled in volume, then ceased abruptly. From the tunnel a line of figures came swimming—Maagog women, eight of them. Each held a child; an infant hugged to the mother breast; two or three older little boys dangling in the water held by the mother's hand; and one, a boy almost half grown, swimming close by his mother's side.

The children were all naked—puffed, dead-white little things, with goggling eyes and gaping mouths. One or two were crying.

The line slowly passed me, swung about, and went to the platform. On that row of toadstool seats the mothers took their places.

(*Continued on page 70*)

Digitized by Google Original from UNIVERSITY OF CHICAGO

"SOME Argument you had this morning"

"*Sure* was. We'd probably be at it yet if I hadn't had these Starrett Calipers to back me up. But when a man *knows* he's right not even the foreman can down him."

You can always rely on a Starrett Caliper Just the right stiffness without being clumsy. Contact points hold their shape and wear well. Can be set surprisingly close to size. Fine, dependable adjustment. All the Starrett Calipers and Dividers are shown in free Catalog. Write for No. 22 "LE"

STARRETT
LOCK-JOINT CALIPER
No. 36

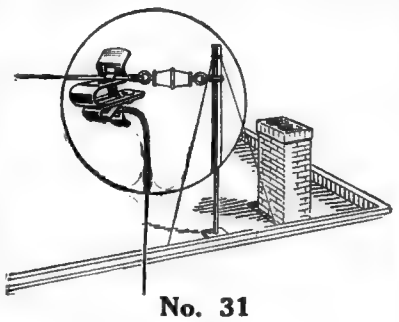
THE L S STARRETT CO
The World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
ATHOL, MASS.

6024

Use Starrett Tools

Digitized by Google
Original from UNIVERSITY OF CHICAGO

FAHNESTOCK'S
LATEST RADIO HELP



No. 31
THE
Antenna Connector
Price 10c

Snap larger connector over Antenna Wire; insert Lead-in Wire into smaller clip and a perfect connection is the result.

At Your Dealers

Fahnestock Elec. Co.
LONG ISLAND CITY
NEW YORK

Safety
demands the
BRACH
vacuum radio
ARRESTER

made to protect, not to meet a price

APPROVED by the NATIONAL BOARD of FIRE UNDERWRITERS
SOLD BY ALL DEALERS
L. S. BRACH MFG. CO.
NEWARK, N.J.

Your Radio Set needs SOLDERALL
a real metal solder in paste form
Ready for instant use

25¢
Solders All Joints
INSURES CLEAR RECEPTION
On Sale at All Dealers
The SOLDERALL CO.
NEWARK, N.J.

The Infinite Vision

(*Continued from page 70*)

"The essential fact is that this element has the same properties as selenium, only in a million times more sensitive a degree. In absolute darkness it is an absolute non-conductor of electricity, but let the tiniest ray of light strike it—though that ray came across the universe—the substance immediately becomes proportionally conductive. Within the light-proof room above, the light from the mercury reflector comes to a focus upon this tube. I shall not attempt to explain the process by which the electrical impressions are generated, amplified, translated again into light, and finally projected to the screen below. It is far too intricate, and would require hours to explain satisfactorily. Due to the lack of time, neither shall I relate the circumstances of the discovery of this element further than to tell you that I was curious as to the cause of a bright violet line, which occasionally flashed into the spectrum of a rare ore that I was analyzing."

OBSERVING MARS

Then drawing his watch from his pocket, he continued impressively: "In twenty-five minutes, the planet Mars will have reached its closest possible approach to the Earth. Then we shall learn her secret. If you will pardon me a moment, I will return the lucium to its proper place."

He was soon back, and even as he returned, the sound of distant thunder became plainly audible in the clear mountain air.

"One of the summer thunder storms common among these mountains is coming up," he explained simply. "I will adjust the reflector now, lest it give us trouble when it arrives."

"But, Monsieur, it will spoil the observation! Even when it recedes, zee air currents will be atrocious!" cried Flambeau in the first words he had spoken that night.

Faxworthy made no verbal reply, but motioned them out onto a small balcony on the east wall of the structure. He pointed his finger to the moon, which was being slowly obscured. Following his motion, the others gazed in the same direction. What they saw was a ghostly cylinder of faint luminescence issuing from the small tower on the roof, and reaching outward into space as far as the eye could see!

"The dispelling ray," briefly explained their guide. "The ether waves of the fortieth octave which have the property of expelling all matter from their path. The range of this ray in the atmosphere is about six hundred miles, and as long as the telescope aligns in its path, it effectually eliminates all interference from atmospheric or meterologic conditions."

The wondering silence that followed was broken only by a stifled "Mon Dieu!" from Flambeau. That one man could have produced so many wonders seemed almost incredible to the group of distinguished scientists.

The silence was not broken, even as their guide led them back to the control room. Swiftly he brought the colossal telescope to the zenith, where the great red star still steadily gleamed. Synchronically the unearthly band of light on the dome swung upward until it came to rest in the same direction.

Again the first two vacuum tubes flashed into light; again that strange beam of luminescence shot down from the ceiling, and there came into being upon the screen the image of a great red star, magnified to the diameter of a baseball. Two more of the tubes, and the image doubled in size. Now a complicated network of delicate lines could be discerned upon its dull crimson surface.

(*Continued on page 74*)

Better Tone for Your Radio!
FRANK D. PEARNE, famous Radio engineer, says TRANSCONTINENTAL RIBBON Aerials aid reception by combining maximum surface with minimum resistance. FORREST, eminent inventor, says, "I get best results by twisting Ribbon Aerial, 2 twists per 50 feet." Complete with snap hooks soldered to ends for instant attachment to insulators.

Transcontinental RIBBON COPPER AERIAL
50-Foot $1.50
75-Ft. $2.25
100-Ft. $3.00
150-Ft. $4.50
Trade Mark

Clearer tone, greater volume, increased distance and selectivity guaranteed or your money refunded! Improves any set, tube or crystal. A laboratory product, with capacity, resistance and strength calculated to give better results.

Try It Without Risk! If your dealers cannot supply you, order direct from manufacturer, enclosing price. 100-foot length most generally used. Money-back guarantee protects you.

Acorn Radio Mfg. Co. 1306 S. Racine Ave. Dept. 307 CHICAGO

TRANSCONTINENTAL RIBBON AERIAL

DEALERS! Write for Special Offer!

World's Greatest BATTERY BARGAIN
FREE
Written 2-Year Guarantee Your Proof of Performance

Save 50%

Thousands of Science & Invention readers will profit by this amazing offer. They will buy the famous 2-year guaranteed World Battery at the lowest price ever quoted and with it they will get free a hydrometer and a "B" Battery or a nickeled Auto Spotlite.

Compare These Prices

Automobile Prices	Radio Prices
6 Volt, 11 Plate - - $12.25	Special 2 Volt Storage Battery - - $5.00
Ford, Chev., Mitchell, Hup., Grant, Elgin, Velie, Saxon.	For W. D. 11 and W. D. 12 Tubes. Will run 200 hours on one charge. Rechargeable.
6 Volt, 12 Plate - - $14.00	Special 4 Volt Storage Battery - - - $8.00
Overland, Buick, Reo, Paige, Hudson, Nash, Stude., Dort.	For U. V. 199 Tubes. Same features as 2 Volt.
12 Volt, 7 Plate - - $17.00	6 Volt, 60 Amps. - $8.50
Maxwell, Dodge, Regal, Frank., Briscoe and Crow-Elkhart.	6 Volt, 80 Amps. - 10.00
	6 Volt, 100 Amps. - 12.50
	6 Volt, 120 Amps. - 14.50
Give year and model of car	6 Volt, 140 Amps. - 16.00

SEND NO MONEY

You need not send a penny. Just clip this ad. and mail with your name and address. The battery you specify will be shipped to you the day your order is received. When the battery arrives, inspect it—read our 2-year guarantee before you pay one penny. Convince yourself you are protected from every angle—that the World Battery saves you 50 per cent. Get the "B" Battery and hydrometer, or Auto Spotlite FREE. Clip the ad. and send your order today.

WORLD BATTERY CO.
Dept. 1981 1219 So. Wabash Ave., Chicago, Ill.

5 Per Cent Discount for Cash with Order

CATALOG 148 PAGES FREE

Latest Reflex Neutrodyne and Super-Heterodyne Circuits. 40 Diagrams, latest Hook-ups. Largest Complete Stock.

SPECIAL American Reflex Super-Sensitive Crystal, 35c ea. Hot as Hot, Every Spot. Hear stations clearly. GUARANTEED ONE YEAR. Jobbers and Dealers write for Quantity Discounts.

10 HOUR SERVICE
AMERICAN RADIO MFG. CO.
WHOLESALE DISTRIBUTORS
Dept. F. 6 West 14th St. Kansas City, Mo.

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

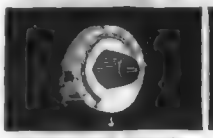
Digitized by Google
Original from UNIVERSITY OF CHICAGO

"BUILD YOUR OWN" WITH "RASCO" PARTS!

Buy from the Oldest and Original Exclusive Radio Parts House in the United States

We pay ALL transportation charges in U. S. ALL GOODS SENT PREPAID IN 24 HOURS

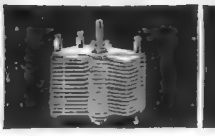
Order direct from this page. **SPECIAL PRICES FOR THIS MONTH ONLY** **Money refunded if goods do not satisfy**



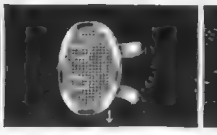
Rheostats and Potentiometers
Come with metal dials and composition knob. Excellent merchandise despite low price.
Y4210 6 ohm Rheo..$.27
Y4211 30 ohm Rheo. .30
Y4212 200 ohm Potentiometer ..... .45

Moulded Dials
Only very best grades handled. Bushings absolutely true. Dials cannot wobble. Letters inlaid in fast white enamel. All dials for ¼" shaft.
Y3074 Dial 2" ....$.20
Y3075 Dial 3" .... .25
Y3076 Dial 4" .... .40

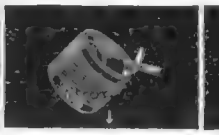
Tapped "B" Batteries
We positively guarantee these batteries to be of long life. We carry only fresh stocks. All with taps.
Y2250 Sm. 22½ V.. $.85
Y2251 Medium Navy size, 22½ volt..... 1.20
Y4500 Large size, 45 volt 2.30



Panel Mounting Condensers
Positively no better condenser on the market. Shafts ¼". Save from 40 to 60% by assembling condenser yourself.
Y1111 11 plate....$1.10
Y2121 21 plate.... 1.22
Y4343 43 plate.... 1.33



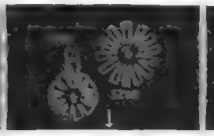
"Rasco" Bezels
Finest Bezel on the market. Bezel comes entirely nickel plated. Can be used on ⅛ or 3-16" panel.
Y1700 Rasco Bezel, 1" .....$.15
Y1701 Bezel, 1½" diam. 20



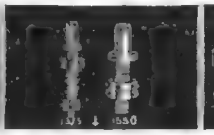
Rasco 180° Variocoupler
Silk wire wound on bakelite tubes. Six taps. Wave length, 150 to 600 meters. For panel mounting. ¼" shaft. Your money refunded if it is not all we claim.
Y3100 Variocoupler prepaid $1.50

Dilectryte Panels
Highest dielectric strength as per Bureau of Standards.
Y7100 7x10x3-16". $.70
Y7120 7x12x3-16". .85
Y7140 7x14x3-16". .95
Y7180 7x18x3-16". 1.25
Y7210 7x21x3-16". 1.45
Y7240 7x24x3-16". 1.65

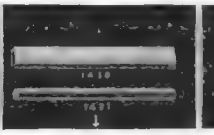
Silicon Steel
Used practically in all audio-frequency transformers. Better than iron. Extremely soft, ⅝" wide and .007" thick.
Y4900 Silicon steel, per foot .....$.08



Spider Web Forms
Fine forms to wind your spider webs. Made from hard, well seasoned fibre, 1-16" thick, center and side holes for wiring. Both 5" diameter.
Y3200 Spider form..$.25
Y3201 Spider form.. .25



Y1375 Universal Bearing
to hold rotors. Length of bearing 2⅜" shaft 1¼" thread ½" long threaded sleeve ¾" long, each .....$.25
Y1550 Sockettes. Four of these take one vacuum tube. Grasp tube firmly. Best by test. Set of 4 $.25



Brass Strip and Tubing
Brass strip ½" wide; 1-16" thick; 6" long.
Y1430 Per length....$.10
Y1431 Brass tubing, dia. ¼"-.6" long; length $.15
Threaded Brass Rods
Sold in 6" lengths only.
Y8032 8-32" thread. $.08
Y6032 6-32" thread. .06

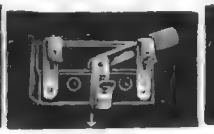
Alcohol Blow Torches
Best made. Give intense hot flame. Great for fine work.
Y8981 5" Torch....$.85
Y8982 8" Torch..... .50
Y4104 Rosin Core Solder. A non-corrosive solder with flux inside.
18" length .....$.10

Monodyne Socket
This socket takes up 25% less room than any other. No outside connections. Nickel plated shell. Has fiber bottom with 4 sockettes. Sockettes hold socket to panel or board.
Y6502 Socket .....$.25

"Rasco" Switch Points
Nickeled and polished.
Y301 ¼"x¼", 6-32" doz. .....$.18
Y304 ½" dia., ⅛" thick, 6-32". doz. .18
Y305 ¼" dia. 3-16" thick, 4-36", doz.. .18
Y375 Switch stop ⅞" long, with nut, doz.. .18

FREE
The big "Rasco" catalogue. Contains all Armstrong circuits. Every up-to-date vacuum tube hookup. Greatest little book printed. Free upon receipt of postal.

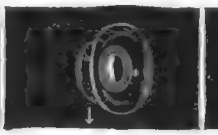
The Radiogem
The simplest radio outfit made. Includes all parts for tuning: coil, tapped switch, crystal, catwhisker.
Y5353 Radiogem, no aerial or phone .....$.75
Y5354 Radiogem, with 1000 ohm phone and 3 ft. cord $3.75



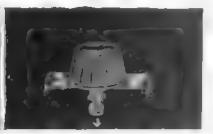
Throw Switches
Mounted on composition block. Small enough for all radio purposes.
Y4100 Single pole...$.25
Y4101 Double Throw Single Pole .....$.35

Bakelite 180° Coupler De Luxe Style
Tubes of natural color bakelite, wound with green silk. Cast aluminum bracket, ¼" shaft. Primary 18 taps. 180 to 550 meters.
Y3150 Coupler.....$2.35

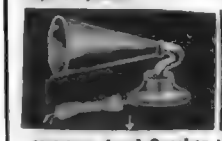
"Rico" (Adjustable) Loud-Speaker Phone
Has rubber gasket underneath diaphragm, making phone fully adjustable. Gives amazing results as loud-talker on 1 and 2 stages of amplification.
Y2525 Speaker with 5 ft. cord $2.65



Soft Rubber Ear Cap
At last! Ear Caps that will relieve headaches, earaches, and undue pressure on the ears. Fit all receivers.
Y3500 Ear caps; pair .....$.50

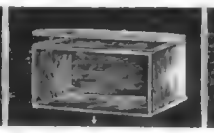


Series Parallel Switch
Quick change from one circuit to another. Black composition knob, nickel plated fittings. Blade radius 1½".
Y2950 Series parallel switch ..... $.25



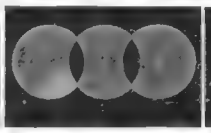
Meletone Loud Speaker
Best popular loud speaker. Fibre horn, heavy metal base, 5-ft. cord. Nickel gooseneck. Greatest tuned (adjustable) talker. Horn length 11½"; bell 6⅝"; total height 9".
Y255 Meletone Speaker $4.75

Nickel Lugs
All lugs are nickeled.
Y310 Brass Lugs for No. 8 screw, doz. .....$.10
Y311 Copper Lugs for Nos. 6 and 8 screws, dozen .....$.10
Y309 Copper Lugs for Nos. 4, 6 and 8 screws, dozen .....$.10

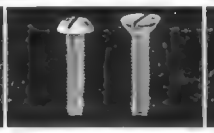


Wood Cabinets
Highest grade mahogany cabinets made. Top is hinged. Made of ½" stock.
Y714 Panel, 7x14" $3.35
Y718 Panel, 7x18" 3.60
Y724 Panel, 7x24" 4.40
Y710 Panel, 7x10" 2.60
Y712 Panel, 7x12" 3.00
Y721 Panel, 7x21" 3.90

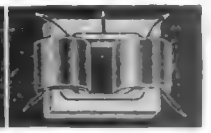
Loop Aerial
Made entirely of well seasoned hard wood. Complete with all parts and base. Total height of loop 36". Can be put together by anyone in less than 5 minutes.
Y2600 Two ft. loop aerial, complete $1.15



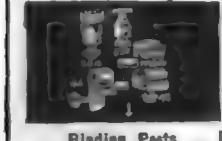
Mica Diaphragms
Made of special India mica in two sizes, 2¼" diameter and 1-13/16" diameter. Cement iron washer in center for real results on your phones.
Y2550 Diaphragm, 2¼" .....$.20
Y2551 Diaphragm 1-13/16" ..... .15



Nickel Screws
Made of brass, nickel plated. Flat and round head style. Any thread up to 10/32".
Price, ¼", ⅜", ½" long, dozen .....$.15
Price, sizes ¾" and 1" long, dozen .....$.30

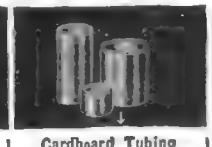


NEW! NEW!!
Push Pull Transformer for many new circuits. See any radio magazine. Made of best materials. Coils impregnated. Silicon steel laminations. Save 50 per cent by assembling yourself. Simple instructions furnished.
Y1159 Transformer. Ratio 6½ to 1...$4.00



Binding Posts
Y030 Sm. size, ¼" high, nickel finish, each..$.04
Y124 Initialed Binding Posts: Antenna; B. Bat. —; A. Bat +; B. Bat. ⊥; A. Bat. —; Ground; Phone; each .....$.12
Y45 Spring Posts, ea. .04
Y44 Spring Posts, ea. .07

Double Phonodapter
Fits all phonographs and will take any standard double head set, thus making your phonograph a loud talker. Made of cast metal, nickel plated. 3 soft rubber bushings.
Y1320 Double Phonodapter .....$.65



Cardboard Tubing
Only seamless tubing made (I.—Inside Diameter. O.—Outside Diameter. L.—Length). Y6600, 3" I. 3⅛" O., 7 L....$.30
Y6601, 3½" I., 3¾" O., 7" L., $.35; Y6604, 4" I., 4⅛" O., 5" L., $.35; Y6605, 2¾" I., 3" O., 2½" L.....$.15

Radio Cement
Weather resisting. Used particularly for cementing covered wires. Coils covered with this cement require no form. Wires hold together solely with this cement.
Y1750 Cement, 2-oz. bottle .....$.50

Bus Bar Wire
Square wire, 1/16" x 1/16", already tinned, making soldering easy. Sold in 2-foot lengths only.
Y6400 Bus Bar, length .....$.05
Green Silk Cord
Rubber Insulation.
Y4400 per foot....$.02

Phonodapter
Will fit any phone. Make your phonograph a loud talker. Fits all phonographs. Made entirely of pure soft rubber with brass tube insert.
Y1310 Phonodapter..$.38

Skinderviken Button
Famous Microphone for Transmitters. Sold all over for $1. This is the genuine article. No imitation. Smallest and most sensitive microphone made. Diameter ¾".
Y9595 Microphone..$.85

VACUUM TUBES

Only the best make tubes carried in stock. All tubes guaranteed to work. Money refunded or tubes exchanged as long as filament lights.

	Each
Y201A 5 volts, .25 amp..	$3.75
Y199 3 volts, .06 amp..	3.75
Y12 1½ volts, .25 amp	3.75

All above types Amplifiers and Detectors.
Y200 5 volts, 1 amp....$3.35 Detector type.

THE ONE TUBE SET THAT BRINGS 'EM IN ON THE LOUD-TALKER.

AUTOPLEX CIRCUIT

The famous Autoplex circuit described in RADIO NEWS has taken the country by storm. The only single tube outfit that works a loud-talker. Results guaranteed.

1—Y714 Mahogany Cabinet, 7x14" .....$	3.35
1—Y7140 Dilectryte Panel 7x14"	1.20
2—Y5350 Moulded Variometers	.80
2—Y3076 4" Dials.....	.80
1—Y5014 1250 turn Honeycomb coil	1.95
1—Y6500 Vacuum Tube Socket	.35
1—Y4310 6 ohm Rheostat..	$.45
8—Y201 "Rasco" Binding Posts	.80
8—Assorted Binding Post Name Plates	.18
5—Y6400 Feet Bus Bar Wire	.25
1—Y5209 Consolidated Autoplex pattern	.50
Total.....	$15.83
Our special price, Complete	$15.25
Complete with Meletone Loud-speaker...	$20.00

"Aristocrat" Post

The Binding Post illustrated is the latest style and has been enthusiastically received. The illustration shows full size. Hard Rubber Composition, Fada type knob, nickel plated bottom piece. Brass screw furnished. Instruction price:
Y2022 Posts—
Each .....$.07
Dozen ..... .80

Y2022

RADIO SPECIALTY CO., 100 Park Place, New York City

Factories: Brooklyn, N. Y. Elkridge, Md.

This Advertisement Copyright, 1924, by R. S. Co., N. Y.

Digitized by Google Original from UNIVERSITY OF CHICAGO

How to Make Soft Wood Beautiful as Hardwood

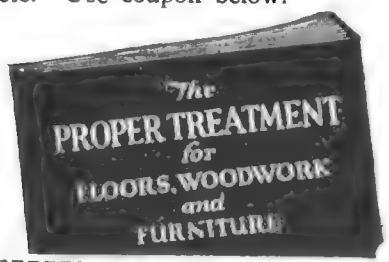
Modern woodwork adds greatly to the attractiveness and convenience of a home. And the finishing of it is a very simple matter if Johnson's Artistic Wood Finishes are used. Our method involves practically no expense. All you need is a little time, a brush, and

JOHNSON'S WOOD DYE

Johnson's Wood Dye is very easy to apply—it goes on easily and quickly, without a lap or a streak. It penetrates deeply bringing out the beauty of the grain without raising it—dries in 4 hours and does not rub off or smudge. Made in sixteen beautiful shades which may be easily lightened or darkened.

FREE-This Book on Wood Finishing

This Book tells how to finish wood in artistic stained and enameled effects. Gives practical suggestions on making your home more artistic, cheery and inviting. Tells just what materials to use and how to apply them. Includes color charts—gives covering capacities, etc. Use coupon below.



S. C. JOHNSON & SON, Dept. S.I.5
RACINE WIS. (Canadian Factory—Brantford)

Please send me free and postpaid your Instruction Book on Home Beautifying and Wood Finishing.

My Dealer is .....

MY NAME .....

MY ADDRESS .....

CITY & STATE .....

The Infinite Vision

(*Continued from page 72*)

Two at a time, the vacuum tubes were switched into the circuit, and ever the image increased in size and detail. Soon it covered the entire screen. Now only sections of the surface were visible, and slowly the sections grew less in extent, as they grew plainer and plainer in detail. Now the view was from the apparent distance of a million miles, now a thousand, now five hundred.

And slowly the delicate lines had grown in breadth, until only two of them, now broad ochre bands two feet wide, intersected in the middle of the screen, in the form of a large circular spot. The center of this spot was thickly strewn with small black dots, which glistened sharply as they reflected the sun's rays.

MARS AT 10,000 FEET

Then without warning, Faxworthy snapped on all but two of the remaining tubes in the bank. Instantly the image on the screen faded into obscurity, and in its place appeared a wondrous scene. There, as though from a ten thousand foot bird's-eye view, stretched a great city.

They were looking down upon great buildings a thousand feet in height, above which swarms of enormous airships darted gracefully through the air. And the decks were covered with tiny figures!

The last two bulbs flashed into life, and the view came to the apparent distance of fifty feet. *The tiny figures were men.* Perfect men of wonderful physique, with finely chiseled faces. They were clad in a raiment resembling that in which Caesar's legion were dressed centuries ago. There were women also, all of glorious form and feature, robed in exquisitely colored gowns, which gleamed in the sunlight with a myriad opalescent tints.

The last two tubes again faded into darkness, and the view receded to the original ten-thousand foot scene.

With an almost imperceptible movement of his hand upon a lever, he brought the landscape flashing across the screen in a glorious panorama.

And while they viewed the surface of the dying planet from pole to pole, the storm that had been rising came up and settled over the top of the mountain. Lightnings flashed, and thunder shook the observatory, but so engrossed were they in the wondrous scene before them, and so protected from interruption by the silent, ghastly ray without, that they were completely oblivious to the disturbance.

Now a vast, red, sandy desert was sweeping across the screen, now a waterway, now another city (always situated at the intersection of two canals), and so from the distance of thirty-three millions of miles, they viewed the surface of the planet from ice clad north to ice clad south. Suddenly the lofty summit of a great mountain capped with an enormous black blotch swept across their vision.

With skillful hand, Faxworthy brought the image back to the center of the screen. The black blotch was a huge building completely covering the top of the mountain, and towering five hundred feet into the air—an almost exact replica of the building in which they stood. *And from its top an enormous ray of unearthly luminescence shot sharply out into space!* Again the last two bulbs flashed into light, and they looked down into the polished bowl of an enormous concave mirror two hundred feet in diameter.

"You see," said the scientist significantly, "unseen eyes are ever watching us from space, and they have been doing so for countless ages."

(*Continued on page 76*)

Sharp turns are easy for the Auto-Wheel

Sharp turns are easy for the Auto-Wheel Coaster even with the heaviest load. The special hound brace which runs from the tongue through the steering pivot to the bed of the wagon gives you the supporting strength which you need for easy steering.

Auto-Wheel

Write for catalog of all models of the Auto-Wheel and the Auto-Cart (for little brother and sister). If you send names and addresses of three coaster wagon dealers in your town, telling which sell Auto-Wheel, we give you a year's subscription FREE to the "Auto-Wheel Spokes-man," our magazine.

Auto-Wheel Coaster Co., Inc.
NORTH TONAWANDA, N. Y.

with genuine AHLBELL NEVERLEAK solid rubber case
Half price on this non-leakable Guaranteed Superior Quality Storage Battery. One-piece indestructible case can't leak, rot, spill or injure rugs or clothing. Read these prices.

5% Discount for Cash in Full with Order

AUTO PRICES		RADIO PRICES	
6-V, 11 Plate, .	$13.00	6-V, 100 Amps. .	$13.50
6-V, 13 Plate, .	15.00	6-V, 120 Amps. .	15.50
12-V, 7 Plate, .	18.00	6-V, 140 Amps. .	17.00

Read our 2 year unconditional Guarantee before you pay a cent. Battery shipped C. O. D. express subject to your approval. Send name and address and style wanted TODAY.
SILVER-S BATTERY CO., 201 E. Ontario St., Dept. 54 Chicago

LEARN RADIO

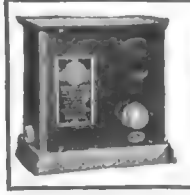
Here's your opportunity. Radio needs you. Win success in this fascinating field. Trained men in demand at highest salaries. Learn at home, in your spare time.

Be a Radio Expert

I will train you, quickly and easily, to design, construct, install, operate, repair, maintain, and sell all forms of Radio apparatus. My new methods are the most successful in existence. Learn to earn

$1,800 to $10,000 a Year

FREE Wonderful, home-construction, tube receiving set, of latest design.
Write for "Radio Facts" free. Engineer Mohaupt.
RADIO ASSOCIATION OF AMERICA
Dept. 65 4513 Ravenwood Ave., Chicago



Charge Your Battery For A Nickel

The Gold Seal Homcharger charges Radio and Auto Batteries at home overnight for a nickel. Your dealer has it. Write for FREE booklet and list of broadcasting stations.
The Automatic Electrical Devices Co.
116 W. 3d St., Cincinnati, O.

Chemicals, Reagents, Apparatus and Laboratory Supplies.

Send for our Free Illustrated Price List
BAKER & UNVERHAU
Dept. S. I. Queens, L. I., N. Y.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Let the World's Strongest Men Show You How to Develop Steel-Like Muscles—*for 15c a Month*

Don't envy the man with a high-powered muscular body. Read the new magazine "Muscle Builder" every month and you, too, can develop your muscles to the maximum of size, strength and endurance. Whether your muscles are now soft, weak and flabby or well developed you will find that every issue of "Muscle Builder" is crowded with live wire articles that are bound to appeal to every two-fisted man. Start right in with the May issue. It contains feature after feature that you cannot afford to miss. Get the May issue at any newsstand or periodical store. The price is only 15c per copy—or only 3c a week on our Special Introductory Offer. Don't fail to secure your copy.

I Can Lift Five Million Pounds in Three Hours

By Warren Lincoln Travis

This is an article by Warren Lincoln Travis, telling how he became the world's champion strong man although he was no stronger than other boys in his youth. Shows how little by little he developed every muscle and his general endurance until he was able to break all World's Lifting Records by lifting five million pounds in three hours and nine minutes. In this article Travis shows how any man can follow his example and have large brawny muscles—quickly. Don't fail to read this article in the May issue of "Muscle Builder." It's well worth while.

You Can Never Swim Again

Johnny Weismuller, World's Champion Swimmer, was told by heart specialists that his career was over. Yet—a few weeks later he was back again in competition. Read the May issue of "Muscle Builder" and learn the important part Weismuller's remarkable muscular development played in carrying him to several new world's records after he was told he would drop dead at any time. Don't miss this article.

I Have Put On and Taken Off Two Tons

This is a remarkably interesting article by Johnny Dundee, holder of two world's titles, who reduces and gains weight with the bewildering magic of a Harry Thurston. Dundee has fought over 400 ring battles and in each combat has added or shed an average of ten pounds. How this marvel of the ring "puts it on" and "takes it off" inside of a week or ten days has never been explained before. The answer is told in the May issue of "Muscle Builder" for the first time, where Dundee reveals all his weight-changing methods. Don't miss it.

Just read over the table of contents for the May issue of "Muscle Builder." Just look at the array of contributors—every one a superman in the world of strength. Read their experiences, follow their instructions and you, too, can quickly have large, brawny muscles—muscles that are as hard as steel—that put you in the strong, powerful, two-fisted man class. Get "Muscle Builder" every month. You will read it from cover to cover, for it is more than a magazine. It is a complete education in the development of a mighty and muscular physique for you.

Don't fail to take advantage of our special introductory offer.

Other Features in the May Issue —Don't Miss Them!

THE SECRET OF MAKING ALL YOUR MUSCLES ALIVE
Famous body-building secrets by Edwin Gray, M. D.

WRESTLE YOUR WAY TO STRENGTH
By Nat Pendelton, who guarantees to overpower Jack Dempsey in a barehand rough-and-tumble in less than 10 minutes.

THE WEAKLING WHO CAME THROUGH
The story of the making of a man out of a mollycoddle.

MY ARM WAS CRUSHED—"AMPUTATE IT," SAID THE DOCTORS
By Demetrius Tofalos, whose right arm, that doctors wanted to amputate, became the strongest arm in the world.

YOU NEED A STRONG BACK.
By Bernarr Macfadden.

In addition to the above articles there are many full pages of "strong man" pictures. Don't miss them!

Special Offer — Only $1.50 For Full Year's Subscription

On this special introductory offer "Muscle Builder" will be sent you every month for a full year for only $1.50. The regular price is 15c a copy. But by filling in and mailing the attached coupon you will make a material saving. So act quickly. Mail the coupon today—NOW!

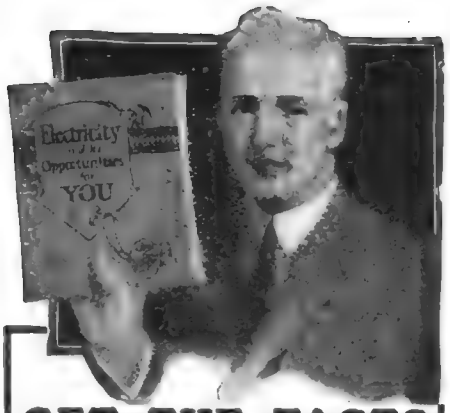
MACFADDEN PUBLICATIONS, Inc.
Dept. M-35, Macfadden Building
1926 Broadway, New York City.

I am enclosing $1.50. Please enter my name for a full year's introductory subscription to "The Muscle Builder", beginning with your May Number.

Name .....
Address .....
City ..... State.....
Name of my newsdealer is .....

Muscle Builder

Digitized by Google
Original from UNIVERSITY OF CHICAGO



GET THE FACTS
about the high-pay opportunities in
ELECTRICITY

Do you want the real, "brass tacks" facts about your chances in the electrical field?

A big new 64-page book issued by the Associated Electrical Engineers of America, gives you these facts, straight from the shoulder! Here is the answer to your questions. You can have it—FREE—by asking for it on the coupon below.

NOW as Never Before Your Chance is in the High-Pay Electrical Jobs

You may think, right now, that there isn't as big an opportunity for you—in electricity—as we tell you there is. But the bed-rock facts of the case show beyond question that there is an ever increasing *shortage* of trained electrical workers, a shortage that can't be overcome for five years, at least.

If you want to know—if you want to be convinced—you'll find the facts you're looking for, in the pages of our great book. You'll find out *why* you can

EARN $15 TO $30 A DAY AS AN ELECTRICAL EXPERT OR IN BUSINESS FOR YOURSELF

Spare time training at home, under direction of the A.E.E.'s engineers puts you in line for the sort of opportunities you are seeking—real jobs, with real pay!

NEW, COPYRIGHTED METHOD OF TRAINING GETS RESULTS

Your progress under the A.E.E. methods of training is swift and sure. Practical, clear, understandable information covers every branch of Electricity—General, Automotive, Radio, and the Business side, too. Nothing else like it. Shows how to make more money right from start—how you can Earn while you Learn.

DON'T LET LACK OF EDUCATION STOP YOU

You don't need much book-education to get the meat in this training. Everything in it is perfectly clear and understandable.

SEND NOW About Electrical Opportunities

Backed by a Legal Guarantee of Satisfaction

You're not taking the slightest risk in sending for our book, or in taking our training, either. If you train in the A. E. E. you are backed by a straight, legally binding guarantee of satisfaction that protects you every step of the way. So once again we say, "GET THE FACTS." Write us right now for copy of the book.

ASSOCIATED ELECTRICAL ENGINEERS

Here's Opportunity's Wide Open Door

Send this coupon to
Associated Electrical Engineers of America
Dept. 354, 537 S. Dearborn St., Chicago, Ill.

Without obligation, send me your 64-page illustrated book on Electricity, together with full details of your remarkable plan of home training and membership in the A. E. E.

Name.....

Address.....

City.....

The Infinite Vision

(*Continued from page* 74)

Then the storm outside broke into its full fury. Lightning played in rapid streams, and thunder echoed and re-echoed with mighty din.

Suddenly a bolt of blinding light reached down from the sky to the tower upon the dome. The partially fused metal gave to the weight, and the great ray slowly fell in a wide arc to the earth. There was a series of frightful reports, as it tore the mountain asunder with its mighty force.

In the room below the image no longer showed sharp and clear upon the screen, but was entirely obscured by a mass of whirling grayish green. Then as the awful crashes rent the air, Faxworthy gave a terrible cry. "THE RAY!" he shrieked and leaped toward the far end of the switchboard! But it was too late!

With a sudden lurch, the thing on the roof had fallen completely to the perpendicular. There was a second frightful din as it rent asunder all within its path, ripping out the very vitals of the delicate apparatus that gave it life! Then it grew dark.

And above in wild cadence the thunder drums of Nature rolled out a pean of victory, over the shattered fragments of the rash mortals who fain would know her innermost secrets.

THE END

Book Review

FORTY YEARS OF EDISON SERVICE. Paper, 181 pages, 8 vo., illustrated. Published by the New York Edison Co.

This little book, designed primarily for the benefit of the public patrons of the New York Edison Co., gives one of the most interesting hour's reading that we have met in some time. It is a complete, though brief, history of the early operations of the company, setting out how it grew from supplying a small district, shortly after the invention of the incandescent lamp, to the present huge proportions, furnishing power and service for billions of dollars in industry.

One of the most interesting things about the book is the large number of old prints and articles that were published at the time the first successful experiments were carried out and the first plants for the actual production of electric lighting were installed.

MODERN THINKERS AND PRESENT PROBLEMS. By Edgar A. Singer, Jr., Ph. D., Professor of Philosophy in the University of Pennsylvania. Cloth, 322 pages, octavo. Henry Holt & Co., New York. Price $2.00.

For some reason a large number of philosophical volumes came in for review during the past month. The book whose name heads this review seems to be the most imposing one of the lot. It gives a very plain idea of how a great many of the modern systems of thought arose. Although the connection is not noted so much in later years, this book shows how the philosopher and scientist of former years were usually very closely connected. The book is divided in the form of chapters, each of which deals with a separate thinker. The selections made show that each chapter outlines a decided advance, a sort of new tack. The earlier chapters of the book deal with Bruno, Spinoza, Hume and Kant, the later philosophers then follow.

The treatises are written in a more or less informal style. Since biographical notes concerning the author and the explanation of his theories are worked in together the ponderance usual to such works is overcome to a great extent.

The last chapter in the book is on retrospect and prospect in which the author restates all the facts so that the reader may briefly review what he has read.

Personal Stationery

200 SHEETS and 100 ENVELOPES Printed with your Name and Address

$1.00

Clear, white bond paper, with envelopes to match. Your name and address printed in beautiful, rich blue ink, on both paper and envelopes, and sent to you postpaid, for only $1.00. (West of Denver and outside of U. S. $1.10.) If inconvenient to send the money, we will ship C. O. D.

Write name and address plainly.

Money returned if you are not more than satisfied. Order today!

Elite Stationery Company
5030 Main Street
Smethport, Pa.

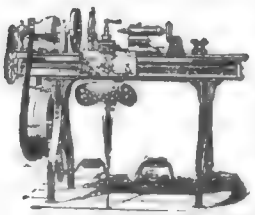
Sell TIRES
DIRECT FROM FACTORY

We want one auto owner in each locality to use and advertise Armour Cords. You can make big money and get your own tires Free by simply sending us orders from friends and neighbors. No Capital or Experience needed. We deliver and collect direct. Pay you daily.

Most Liberal Tire Guarantee Ever Written

Armour Cords are Bonded against Accidental Damage, Wear and Tear, Tread Separation, Blistering, Blow-Outs and Rim-Cutting for 10,000 miles. We are actual manufacturers. Write today for Great Special Offer to Agents and low Factory Prices.

ARMOUR TIRE & RUBBER CO., D 282-A DAYTON, O.



LATHES
9 to 18-inch Swing

List price $135.00 and up, according to size. When ready to buy, send for Lathe Catalog and prices.

W. F. & John Barnes Co.
442 Ruby Street
ROCKFORD, ILLINOIS

"BECOME A LIGHTNING TRICK CARTOONIST"

Make money chalk talking. Send $1 for snappy program of trick drawings, with instructions by a professional cartoonist. Satisfaction guaranteed. Circular free. Balda Art Service, Dept. 4, Oshkosh, Wis.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

MODERN DEVELOPMENT. By Frank R. Fraprie, S.M., F.R.P.S., Editor of American Photography. Cloth, size 7½"x 5", 70 pages. Published by American Photographic Publishing Co., Boston, Mass., $1.50.

A most complete book on the subject of development as relating to photography. The first few pages of the volume deal with the theory of the action of light on a photographic plate and take up the reasons for the necessity of development in order to bring out the image. Developing agents are then classified as to use and efficiency and are fully discussed. Various methods of accelerating development are given and the uses of certain developers for different kinds of work are fully treated. The equipment of the laboratory is touched upon and the necessity of a safe dark room is carefully brought out. The major part of the book is taken up by formulas for various developers. With each one is given the methods for using it if any special care or usage is to be observed. The length of time necessary for correct and full development is given in almost every case and sufficient information is presented in a concise form to enable almost anyone to be able to prepare his own developer and use it properly.

The only drawback to this entire book is that despite its complete data and the ability the author shows in handling the various subjects, still there is no index of any kind provided which would enable one, after reading the book, to turn directly to any particular item upon which he wishes to refresh his memory.

TEXT BOOK ON WIRELESS TELEGRAPHY, in two volumes. By Rupert Stanley, B.A., M.I.E.E. Fully illustrated, hard covers, size 8¾"x5½", total 865 pages. Published by Longmans, Green and Co., N. Y. C. Two volumes, $10.00.

The radio amateur who purchases the two volumes of this book need not worry about his missing anything at all connected with radio theory or practice. These two books and a subscription to an up-to-date radio magazine will give sufficient material for a complete education in radio.

The sub-title of Volume I is *General Theory and Practice* and it covers the field in an excellent manner. The first few pages deal with the relationship between the earth, the atmosphere and the ether. The principles of electricity in its various forms are next taken up and various electrical measurements and calculations dealt with in a thorough manner which is at the same time as free from technicalities as it is possible to make the subject and still put it in the correct form. The theory of various pieces of apparatus such as the condenser, induction coil, alternator, transformer, etc., are next discussed. One of the next chapters deals with the historical side of radio telephony and telegraphy and much interesting data is included therein. The author goes on to discuss various theories and practical devices which will be of interest to all, both experimenter and broadcast listener.

The title of Volume II is *Valve and Valve Apparatus* and therein is found one of the most complete discussions of the vacuum tube ever published. The theory of the valve or vacuum tube is discussed when used both as detector and as an amplifier. The various types of amplifiers, radio and audio frequency, are then theoretically explained and the amateur can find much in these explanations which will enable him to operate his set at a higher efficiency. The latter part of this excellent work deals with various valve transmitting sets for phone, C. W. and I. C. W. The last few chapters touch on various phases of work directly or indirectly connected with radio and such devices as the direction finder and systems of earth telephony are discussed.

NEW LANDS. By Charles Fort (author of "The Book of the Damned") with introduction by Booth Tarkington and blurb by Theodore Dreiser. Cloth, 250 pages. Boni & Liveright, publishers, New York. Price, $3.00.

This book may not be philosophy but it certainly is philosophical in form. Many iconoclasts will hail its appearance in much the same manner as Joseph Smith embraced "The Golden Plates."

The book begins by stating that the world is gradually growing too small to support a population that is growing by leaps and bounds. "Ergo," says Mr. Fort, "new lands must be found wherein potatoes and cabbages may be raised to feed the ever increasing offspring of a very prolific race." On this hypothesis he continues to write the remainder of the 250 pages in contradiction of the laws of astronomy according to the college professors . . . and scientific scholars.

The book is given up almost entirely to a myriad of experiences reported from all parts of the world to prove that astronomers overlooked a lot of important evidence when they were investigating certain celestial phenomena and that a great many such phenomena which should have been considered in their investigations were overlooked entirely. A great amount of this evidence which Mr. Fort puts forth as being of extreme importance consists of noises seeming to emanate somewhere in the upper atmosphere.

Not that he uses it in any way as the genus of proof but more as a sort of importance of gesture. Mr. Fort quotes Mr. George Bernard Shaw as saying that the moon is approximately 37 miles from the earth. Mr. Fort would have us to be

Aviation is Still in its Infancy

Aviation Brings Quick Success Fascinating—Daring—Big Paying

To young men of daring no other field of work offers such a fascination, such high pay, nor such opportunities for quick success as the field of Aviation. As yet, aviation is practically in its infancy. NOW is the time to prepare.

PREPARE NOW FOR THE FUTURE

Aeronautical Instructor $60 to $150 per week
Aeronautical Engineer $100 to $300 per week
Aeronautical Contractor Enormous profits
Aeroplane Repairman $60 to $75 per week
Aeroplane Mechanician $40 to $60 per week
Aeroplane Inspector $50 to $75 per week
Aeroplane Salesman $5000 per year and up
Aeroplane Assembler $40 to $65 per week
Aeroplane Builder $75 to $200 per week

Amazing Opportunities in the Airplane Industry

In the automobile industry and in the moving picture business hundreds of men got rich by getting in at the start. They made their success before others woke up. Today, these lines offer no greater opportunities than a hundred and one others. BUT AVIATION IS NEW. Get in while there is an opportunity. All over the country there will be a clamor for trained men. It will not be a question of pay but of getting capable men.

A Sure and Easy Method of Becoming an Aviation Expert $50 to $150 per Week

The study of aviation is almost as fascinating as the actual work. Every lesson is full of interest. That is why it is easy to learn aviation. You do not have to make yourself study—it is like reading an interesting book that tells you things you have always wanted to know. Only one hour each evening will give you the basic training in a surprisingly short time.

One student, S. F. McNaughton, Chicago, says: "Your lessons are like a romance, and what is more, after one reading, the student gets a thorough understanding. One never tires of reading them." James Powers, Pa., another student, says: "I am indeed surprised that such a valuable course can be had from such practical men for so little cost."

Personal Instruction by Experienced Men

Men who have had actual experience give you personal attention. They select the lessons, lectures, blueprints and bulletins. They tell you things that are essential in everyday practice. Each lesson is easy to read and understand.

Get Big FREE Book Now

Send coupon below for New Book, just out, "Opportunities in the Airplane Industry." It is interesting and instructive. It will show you many things you never knew before about aviation. Due to shortage of paper we could get only a limited supply of these books—send the coupon before they are all gone.

American School of Aviation
Dept. 7455
3601 Michigan Avenue Chicago, Ill.

AMERICAN SCHOOL OF AVIATION
3601 Michigan Ave., Dept. 7455, Chicago, Ill.

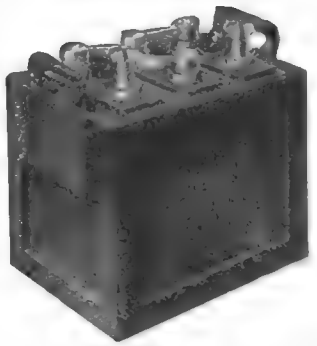
Without any obligation, send me your Free Book, "Opportunities in the Airplane Industry," also information about your Course in Practical Aeronautics.

Name .....

Street .....

City ..... State .....

Digitized by Google Original from UNIVERSITY OF CHICAGO



MARKO "A" BATTERY

90 AMP. HRS.

IN RUBBERLITH CASE

Ornamental As Well As Efficient

The Rubberlith case is a composition case with a high gloss giving the appearance of ebony. It is moulded in one piece, including handles and cells—no jars to break—and is practically indestructible. A worthy addition to your set.

ALL SIZES, FROM 2 VOLT BATTERIES UP, CARRIED IN MAHOGANY FINISH CASES

DISTRIBUTED BY

MARKO STORAGE BATTERY CO., 210 West 54th St., New York, N. Y.
MARKO STORAGE BATTERY CO., 102 Jefferson Ave., Brooklyn, N. Y.
NATIONAL LIGHT AND ELECTRIC CO., 289 Market Street, Newark, N. J.
RADIO DISTRIBUTING CO., 8 W. Park St., Newark, N. J.
THE VERMONT RADIO CO., Richford, Vermont.
SCHIMMEL ELECTRIC SUPPLY CO., 526 Arch St., Philadelphia, Pa.
SHIPLEY & MURPHY, 2107 14th St., N. W., Washington, D. C.
CASS J. STOLL, 172 State St., Binghamton, N. Y.
AUTO BATTERY CO., 115½ Broadway, Providence, R. I.
RUSSELL & PARKS, 225 Western Ave., Lynn, Mass.
CONSOLIDATED WIRE & ASSOCIATED CORPORATIONS, Green and Congress Sts., Chicago, Ill.
WEINIG URBAN ELECTRIC CO., Inc., 66 Allen St., Buffalo, N. Y.

Sold by Radio Supply Stores and all Marko Service Stations

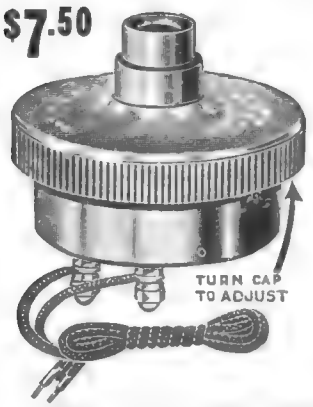
MADE BY

MARKO STORAGE BATTERY CO., 1402 Atlantic Avenue BROOKLYN, N. Y.

The "Rico" Grand Opera Loud Speaker Unit

Patented, December 25, 1923.

$7.50



You have read no doubt that *every* loud-speaker is positively the best manufactured. We could make similar claims—on paper—and perhaps go the other one better. Modesty, however, forbids. For that reason, we make this statement:

Get a "Rico" Grand Opera Loud-Speaker Unit. Compare it with ANY loud-speaker that you have ever heard. Merely consider that the money you have paid for the "Rico" Unit is on deposit. If after five days you find that the "Rico" Grand Opera Loud-Speaker Unit does not give you greater volume and greater clarity of sound and greater joy than any other loud-speaker unit, then our dealers or ourselves will be glad to refund the purchase price.

DESCRIPTION: This loud-speaker unit is ideal for phonographs. With this unit you can turn your phonograph into a loud-speaker. Any good horn, however, can be attached to it. Speaker does not work with crystal sets, only on vacuum tubes.

No Metal Can Touch the Diaphragm

This is a feature not found in any loud-speaker except the "RICO" GRAND OPERA LOUD-SPEAKER UNIT. Diaphragm cannot rattle. Metallic, harsh sounds are entirely eliminated AND the "RICO" GRAND OPERA LOUD-SPEAKER UNIT *is fully adjustable.* For light or soft tones, simply turn the milled rim. With this arrangement you can get either tremendous volume or soft tones as desired.

Aluminum shell and cap highly nickel-plated and polished. Five-foot green cord furnished. No. 75 "RICO" GRAND OPERA LOUD-SPEAKER UNIT as described. Price, $7.50.

Radio Industries Corporation

131 Duane St., New York City

Cable Address: Ricotrade, New York

S. & I. 5-24

MOTOR CAMPER & TOURIST

THE SIGNPOST OF THE OPEN ROAD

A New Magazine—The only publication that covers Touring and Camping by motor. Tells in detail Where to go in your car, What to take and how to get the greatest pleasure from the trip.

FIRST ISSUE JUNE—ON SALE MAY 15th

On all newsstands, 25c. the copy. Subscriptions $2.50 per year

GERMOTT PUBLISHING COMPANY

Successors to Practical Electrics Co.

53 PARK PLACE NEW YORK CITY

Insure your copy reaching you each month. Subscribe to Science and Invention —$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Digitized by Google

lieve that there are some sort of other lands lying somewhere in the atmosphere of the earth a short distance from it, which may be investigated if the inhabitants of earth ever find it necessary to make explorations outside of our present range of geography. Which is to say that Mr. Fort has written 250 pages of very interesting and at times extremely amusing alleged proof, which in the final analysis proves nothing.

A THEORY OF KNOWLEDGE. By Charles Augustus Strong. Cloth, octavo, 102 pages. Published by Macmillan Co., New York. Price, $2.00.

This whole volume is more or less abstruse and it is entirely possible that the man who reads in the subway as he goes to work in the morning will not appreciate this volume. In order to give an idea of the contents and ideas of the book we quote:

"The theory set forth in the following pages rests on two assumptions: that there is a real world in time and space, and that the self is a part of it. . . . I conceive the self as consisting of immediate experience; or feeling. In the first chapter I endeavor to show that there is such a thing as immediate experience; that is, experience in which there is no distinction of subject and object. In the second, I give reasons for thinking that immediate experience is in time and space, and constitutes the inner being or substance of the things we perceive. The self would then be identical with an extract from, or pattern of processes in, the nervous system. In the third chapter I discuss the bearing of this on knowledge. I draw in the fourth chapter the consequences that follow from the theory as regards life and action."

It will be seen from the paragraph quoted from the introduction, that the contents of this are extremely abstract. However, in its field it is good.

DIRECT CURRENT MACHINERY. By Harold Pender, Ph. D. (Fellow, American Institute of Electrical Engineers; Member, American Philosophical Society). Cloth, 314 pages, John Wiley and Sons, New York. Price, $3.00.

The author of this book, being connected with the Electrical Engineering Department of the University of Pennsylvania, and at the same time being a practical electrical engineer, has seen the need in his engineering experiences, of a textbook on direct current machinery which gives adequate treatment of the theories and performance of these machines and that does not at the same time go deeply into the design of such apparatus. His first few chapters follow the usual order in setting out definitions of the primary laws and theories. Following that, are chapters on commutation, armature reaction, voltage regulation and testing. No words are wasted in his statements of laws, theories and axioms. He is especially terse and to the point. The same holds good throughout the book. It is one of the most easily understood volumes on direct current machinery, which goes fully into the subject, that has come to the attention of this department in some time.

SPARROW. The Chinese Game Called Ma Ch'iau. Ly Yu Sang, M.A., Member Kwong Tung Economic Research Bureau Science Society, etc. Cloth, octavo, 128 pages. Long Sang Ti Chinese Curios Co., Inc., N. Y., Publishers.

Ma Jongg, or, as the author calls it, Ma Ch'iau, may not have a great deal of art in it, but it certainly has a large scientific content. As a matter of fact, it almost takes a blue print to play the game, at least the writer of this review is positive that if he had a complete set of blueprints, he could, after studying them in connection with a complete set of specifications, master this game which for so long filled the idle years of ancient respectable Chinese Mandarins. This work comes near to being the set of blueprints and specifications that the reviewer has said would be helpful in understanding the game. In the first chapter of the book the author deals with the origin and philosophy of the game. It is through this chapter that the reader is given a sort of plan of the game, i.e., the player of the game is given an idea of the allegorical form behind the play.

The latter chapters of the book, of course, are devoted to the rules of the game, together with a number of the accepted plays and some advice to the novice as to what he should do in certain circumstances.

CRYPTOGRAPHY. By Andre Langie, translated by J. C. H. Macbeth. Hard covers, size 5"x7½", 192 pages. Published by E. P. Dutton & Co., New York City. Price, $3.50.

This book is quite interesting to those devoted to the science of secret writing and many devotees of this art are to be found among us. Some of our periodicals make quite a point of secret writing, and as far back as the days of Edgar A. Poe it was a subject for a journalistic exploitation. Poe himself used to decipher secret writing which was sent to him. In our language Pepy's diary is one of the classic examples of secret writing going way back to the days of the Stuarts and some of the transactions described in it for the credit of the writer were best kept in thoroughly secret writing. To return strictly to our book, we can only say that it treats the subject in a very concise and

Original from UNIVERSITY OF CHICAGO

thorough way. It gives the simple almost childish methods, and then gives the nearly undecipherable systems available for serious work. The author describes some of his experiences in decoding and relates a curious failure when he proved unable to make any sense out of an alleged cipher sent to him, and his friend had to acknowledge that it was merely a jumble of letters without meaning. It is fair to say that in less than two hundred pages of the book, there are many hours of interesting study if we wish to really appreciate the author's work. It is well translated from the French by a Marconi author.

MAN'S PREHISTORIC PAST. By H. Wilder. Profusely illustrated. Hard covers, size 5½"x8", 463 pages. Published by The Macmillan Co., New York City.

A fascinating and particularly conjectural story of pre-historic man is the subject of this work. It is impossible within the limits of our space to give it an adequate review. The numerous illustrations, all opposite to the text, include pre-historic drawings and designs and rock-painting, sculptures, and ancient implements of bone and horn from cave dwellings. Flint instruments have been most carefully examined and the inscriptions and stories evolved from them are strikingly elaborated. A pre-historic man is pictured as attaining his first sense of possession in a fabricated flint implement. The first of these were of any convenient shape which he might pick up, but when shaped by the owner's labor they became an actual possession. The mounting of some of the tools are quite unknown, and some, it is believed, were used without handles. Inscribed tablets of quite uncertain use are also shown.

RADIOACTIVITY. By K. Fajans. Illustrated. Hard covers, size 5½"x8¾", 138 pages. Published by E. P. Dutton & Co., New York City. Price, $3.50.

When an old-time student is inclined to flattering himself that he knows something of science, and investigates radioactivity, isotopy of elements, atomic numbers and structure of atoms involving the nucleus and circumambient electrons, he feels that he has got to begin his studies all over again from the kindergarten up. It is impossible to review this book within the limits of our space. We can only recommend it most warmly to our readers. Old time chemists used to treat the atom as the smallest possible division of matter but now the atom becomes fairly gigantic compared to its nucleus and electrons. The book cannot be read rapidly, but it is so well put that it can be treated as a literary production, and we gladly recommend it to our readers.

Radioactivity brings us face to face with the transmutation of metals and with the strange complexity of chemistry involved in isotopes. Some metals exit in varieties of different atomic weights, yet each variety is absolutely indistinguishable from any other by any chemical process. In other words radioactivity in its powers and developments transcends chemistry.

The great mystery of the atomic nucleus is also given attention in a chapter; another chapter treats of the artificial decomposition of atoms.

An excellent selection of tables, fourteen in number, is included, and over ten pages devoted to references and notes give the bibliography of the subject in excellent detail.

WEATHER PROVERBS AND PARADOXES. By William J. Humphreys, Ph.D. Cloth covers 5½"x7¾", 125 pages, profusely illustrated. Published by Williams & Wilkins Co., Baltimore, Md. Price $1.50.

This handbook on weather proverbs and paradoxes by one of the foremost experts on meteorology, is invaluable and should be on the library table of every well-read scholar. The reviewer found this book intensely interesting, as it explains in a clear untechnical manner, the scientific reasons why some of our old weather rhymes are liable to prove true or the reverse. We find as we read through the book, that many of the old weather proverbs which we modernists are wont to scoff at, have indeed a good scientific basis behind them. Ground Hog Day represents one of the exceptions, as does also St. Swithin's Day. This valuable little work will certainly, we promise you, provide a better education in foretelling the weather than almost any other book that we can think of. The author's style is very entertaining and attractive, and the book is liberally illustrated with some very excellent photographs showing the various forms of clouds, rainbows, fogs, etc., all of which have a distinct bearing on weather forecasting.

THE TOMB OF TUT-ANKH-AMEN. By Howard Carter and A. C. Mace. Cloth covers 6"x9", 334 pages, with many illustrations. Published by George H. Doran Co., New York City. Price $5.00.

This is the first volume describing the finding and excavation of the tomb of Tut-Ankh-Amen written by men who, with Lord Carnarvon, discovered this famous tomb. This volume provides very interesting reading and the pictures embellishing the work are very fine, having been taken by Mr. Harry Burton of the Metropolitan Museum of Art of New York City. There are one hundred and four illustrations from photographs together with a map of the tomb. The

I Guarantee

To Make You A Public Speaker or I Wont Take A Penny

Give Me 15 Minutes a Day

I'll Show You How to Control One Man or a Big Audience—How to Conquer Stage Fright—How to Increase Your Earnings—All by the Power of Effective Speech.

THAT'S all I want, 15 minutes a day, to prove to you beyond a shadow of a doubt that I can do for you what I have done for other men—increase your income, make you a leader, make you successful.

C. F. Bourgeois, President of Robischon & Peckham, says: "The lesson on 'How to Develop Personality' is alone worth the entire cost of the course. It has been of real practical help to me." Walter O. Ford of the Ford Manufacturing Company writes, "Was always considerably flustered when called upon to speak. Now, thanks to your course, I feel perfectly at home and confident. Every man who wants a strong personality and the power of effective speech should take your course." H. B. McNeal, President of the Telephony Publishing Company, says: "It should appeal to every man and especially to young men who are ambitious for rapid promotion."

Increase Your Salary

These men write as do hundreds of other successful men concerning this amazing new method of making you a forceful, fluent, convincing speaker. Why do salary increases and the big-pay jobs seem to just come naturally to one man when all about him are men of equal ability in other respects? I'll tell you. The successful man has the knack of making every word he says or writes count in his favor. He is never at a loss for the right word and he presents his proposition or views in clear, logical and forceful language. He gets what he goes after.

Sway Others at Will

How many men can address a dignified board of directors and have his plans and ideas instantly approved? How many men can appear at a moment's notice before an audience and create enthusiastic notice? Not many. And yet there is no reason why any man should not be able to do those things.

What This Amazing Course Teaches You

How to make after-dinner speeches.
How to write better letters.
How to sell more goods.
How to have a good memory.
How to enlarge your vocabulary.
How to make political speeches.
How to develop self-confidence.
How to have a winning personality.
How to be master of any situation.

I don't care what line of business you are in. I don't care how embarrassed you now are when you are required to speak. I don't care what you think now. I can show you how to rise quickly above the mass in business, how to step to promotion, how to be a leader with poise and the assurance to plunge right into any subject and convince your hearers of your point of view. By this amazing new method, made possible by Professor R. E. Pattison Kline, formerly dean of the Public Speaking Department of the Columbia College of Expression, being a powerful speaker is easy and simple.

Make This Free Test

To convince you fully that you can become a powerful and convincing speaker by giving me only fifteen minutes a day right in the privacy of your own home, I will send you a remarkable FREE self-test, and then you can judge for yourself. I want you to determine whether or not you wish to have this power of speech that men envy and women applaud. Also, because I know that you will be so delighted that you will tell others of this amazing method, I am making a special offer for a short time only.

Send No Money

Fill in the coupon and mail at once. You, like thousands of others, can quickly and easily learn the secret of achievement both in position and salary and all this without leaving your present position and by devoting only a few minutes a day to the fascinating material I will send you. Just give me your name and address on the coupon.

NORTH AMERICAN INSTITUTE

Dept. 7445, 3601 Michigan Ave., Chicago

NORTH AMERICAN INSTITUTE,
Dept. 7445, 3601 Michigan Ave., Chicago, Ill.

I am interested in your coupon in Effective Speaking and your Free self-test and special offer. Please send me full particulars. This request places me under no obligation of any kind.

Name .....

Address .....

City ..... State .....

..... (In Box)

Digitized by Google Original from UNIVERSITY OF CHICAGO

CAN YOU

think of a simple, practical idea that will fill one of the many requests we have on file for new inventions? It may mean a fortune for you. Thousands of things are needed Right Now. Your brains can help. Send today for our great new book — "Inventions and Trade Marks, Their Protection and Exploitation" and learn more about making money from ideas than you ever knew before. It tells many things that are wanted, too.

A postal will do— it is free.

We help our clients without charge, to get the dollars out of their ideas — having facilities none others

Advice Free.

Don't delay — get the book at once.

AMERICAN INDUSTRIES, INC.
225 Patent Dept.,
WASHINGTON, D.C.

PATENTS ADVERTISED For SALE FREE

In Invention and Manufacturing Supplement.

Published for the man with an idea. Send for free sample copy. One year's subscription 50c.

MAKE MONEY AT HOME

YOU CAN make $1 to $2 an hour writing show cards at home in your spare time. Quickly and easily learned by our new simple method. No canvassing or soliciting. We show you how, guarantee you work at home no matter where you live and pay you cash each week. Full particulars and booklet free. Write to-day.
AMERICAN SHOW CARD SYSTEM LTD.
Authorized and Fully Paid Capital, $1,000,000
110 Adams Bldg. Toronto, Canada

PATENTS Patent Litigation Trade Marks Copyrights

Handbook of Instructions, "Inventive Knowlege" Free on Request
R. H. FRAVEL, Patent Attorney
Formerly of the U. S. Patent Office Examining Corps
Room 207, 3503 McLachlen Bldg., Washington, D. C.

C. L. PARKER
Ex-Member Examining Corps, U. S. Patent Office
Attorney-at-Law and Solicitor of Patents
American and Foreign Patents secured. Searches made to determine patentability, validity and infringement.
Pamphlet of Instructions sent upon request.
McGILL BUILDING WASHINGTON, D. C.

PATENTS As one of the oldest patent firms in America we give inventors at lowest consistent charge, a service noted for *results*, evidenced by many well known Patents of extraordinary value. *Book, Patent-Sense, free.* Lacey & Lacey, 644 F St., Wash., D.C. Estab. 1869.

STUDY AT HOME
Directed by
The University of Chicago
Courses in English, History, Chemistry, Business, Mathematics, Education, Psychology, and 35 other subjects command credit toward a Bachelor degree. Begin any time. Address 27 Ellis Hall, University of Chicago, Chicago, Ill.

PATENTS
Trade-Marks, Copyrights and Patent Litigation
Write for advice and instructions how to proceed, costs, etc.
Hand Book with illustrations of 100 Mechanical Movements sent free on request.
ALBERT E. DIETERICH
Patent Lawyer and Solicitor
Successor to Fred G. Dieterich & Co.
602 OURAY BLDG. WASHINGTON, D. C.

forepart of the book opens with an introduction in the form of a biographical sketch of the late Lord Carnarvon by Lady Burghclere.

A very interesting and desirable history of the King and the history of the Valley of the Kings is provided. Chapter 5 takes up the discovery of the Tomb, the preliminary investigation, the survey of the Antechamber, then the clearing of the Antechamber.

One of the most interesting chapters describes the work done in the laboratory to preserve and reconstruct some of the pieces of jewelry and furniture found in the famous cenotaph, and the large type and excellent style in which the story is told, makes the tale a most interesting one, and in fact the reviewer became so imbued with the spirit of the ancient world, that he found it hard to give up the book at bedtime. The later chapters deal with the opening of the Sealed Doorway to the sepulchral chamber, and a well arranged appendix then follows with a description and large photographic representations of the various vases and pieces of furniture found in the Tomb. An adequate index is provided at the end of the work. This authoritative work on the Tomb of Tut-Ankh-Amen is a volume which those who have followed newspaper accounts of the excavations at the Tomb, should certainly read, as the reviewer found it difficult to get the newspaper series to fit together clearly in his mind, particularly due to the fact that the rotogravure photos were published independently, in most cases, with respect to the long textual accounts published in the text.

ROBERT FULTON AND THE SUBMARINE. By Wm. Barclay Parsons. Hard covers, 7"x9¼", 154 pages, illustrated. Published by Columbia University Press, New York City. Price $4.00.

This work includes a considerable amount of Robert Fulton's own descriptions and drawings of his submarine, while his experiences with both the British and French Governments during his sojourn in those countries, are given in interesting style. Robert Fulton, like many other inventors of the past and present, found plenty of minds which did not concur with his, even after he had demonstrated in a most surprising way that it was possible to use a submarine to attack war vessels and attach a bomb provided with a clockwork or other detonating mechanism. It is surprising to read the description written in Fulton's own words, as to how the submarine could be improved, how the bombs should be built, etc. Who would think for a moment that Fulton had been able to descend under water with his submarine, and stay there for several hours? It is surprising also to note that at that early day, over a century ago, this progressive inventor had experimented with compressed air stored in bombs, so that exhausted air could be released slowly while submerged, in order to remain under water for a greater length of time. One of his calculations demonstrated that by using this compressed air stored in a bomb or reservoir, he could take care of four men and two small candles for six hours. In another test with the compressed air mechanism, he took three companions with him without any candles and plunged to a depth of about five feet with the submarine. At the expiration of one hour and forty minutes, as Fulton states, he began to let off measures of air from the reservoir, and so on from time to time for four hours and twenty minutes without experiencing any inconvenience.

The boat was propelled by a hand-operated screw when submerged, and by sails when on the surface. One of the most astounding tests which Fulton demonstrated for the benefit of the French Government, in his efforts to get Napoleon Bonaparte to recognize the merits of his invention, was where he blew up a small sloop by sneaking up on it with the submarine and firing a bomb close to it. One of the most valuable parts of this well-edited work is Chapter 5, which gives the original "drawings and descriptions" as drawn and written by Robert Fulton himself. Specimens of the original hand writing are reproduced and the original wash drawings are also shown, which proved exceedingly interesting not only for their historic value, but owing also to the ingenuity shown by this genius, who started as an artist and then decided to become an engineer. Strategic schemes for placing the bombs, etc., are shown by the inventor in his drawings, and prove that he was certainly far beyond his time in his philosophy and deductions.

The author of the book says in closing that "The Nautilus, defective as she was in many particulars which Fulton admitted, clearly demonstrated certain facts: firstly, that a boat could be made to plunge and rise at will; secondly, that it could remain under water with a crew of three men for several hours; thirdly that it could be manoeuvered and steered by the compass under water as well as on the surface. These features are the essence of the principle of successful submarine practice, and so much Fulton accomplished."

AUTOMOBILE HANDBOOK. Cloth covers, 3¾"x5½", 345 pages, well illustrated. Published by International Textbook Co., Scranton, Pa. Price $1.00.

This is another edition of the series of small yet very complete handbooks edited and produced by the International Textbook Co., or in other words, the faculty of the International Cor-

RADIO FOR ALL

By H. GERNSBACK

Editor "Radio News," "Science and Invention" and "Practical Electrics"

With over 130 *illustrations and diagrams, and* 12 *photographs,* 300 *pages, size* 8¼" x 5½"

3rd Edition

What the Book Is.

A combination of a radio course for the novice in radio telegraphy and telephony with a reference book for the more experienced amateur. Half a dozen books in one.

For the Beginner.

The theory of radio carefully explained with drawings.

Description of and instruction for operating instruments of receiving and sending sets, with all picture diagrams of the wiring of the apparatus.

How to make your own receiving set, costing from $3.00 to $50.00.

How to read diagrams; for every picture diagram there is a corresponding technical diagram using the symbols instead of drawings.

How to tune sharply and eliminate interference from other stations.

How to protect your set from lightning and the laws regarding installation.

Explanation of time and weather signals.

For the More Experienced Amateur.

How to make a practical vacuum tube detector, two stage amplifier set costing less than $50.00 that will work.

How the radio compass works.

All about underground aerials, loop aerials and directional aerials.

Formulae for finding wave length; miscellaneous formulae for finding capacity of condenser and other instruments. Tables of wire resistances, wave lengths and their corresponding frequencies, approximate wave lengths for different aerials, tuning coil data, and much more invaluable information.

Special Features.

Lists of all the broadcasting stations in the United States and Canada for concerts, time signals, weather reports, press, stock market reports, etc., with their call, wave length and time of sending.

Detailed description of Washington weather signals and their translation.

Description of a modern broadcasting station and its operation.

Large map showing location of all U. S. radio telephone broadcasting stations suitable for hanging up in radio room.

$2.00 Postpaid

GERMOTT PUB. CO.
SUCCESSORS TO
Practical Electrics Co.
53 PARK PLACE, NEW YORK CITY

Digitized by Google Original from UNIVERSITY OF CHICAGO

respondence Schools. The book is well indexed, and will be found of value to all automobilists and those employed in automobile repair work. The forepart of the handbook deals with various types of automobiles, springs, frames and running gear, etc. Then comes a treatise on gasoline engines, both two and four cycle. The explosion and cooling actions in such engines are discussed, as well as the function of the pistons, valves and other moving parts. Vacuum tanks and carburetors are explained and then we come to the speed change gears, steering mechanism, etc. About one hundred pages are devoted to the electric equipment of the modern automobile, and this covers starting motors, lighting, ignition, batteries, etc. A practical section on automobile tires and how to properly inflate, remove and replace them is given with illustrations. American road rules and customs are discussed, and then we find a section on automobile troubles, which should prove valuable for ready reference, as it is sub-divided into sections covering ignition, lubrication, etc. An additional feature at the end of the work is a digest of the automobile laws of the whole country by states.

SYNTHETIC RESINS AND THEIR PLASTICS. By Carleton Ellis. Hard covers 6"x9¼", fully illustrated, 514 pages. Published by The Chemical Catalog Co., Inc., New York City. $6.00.

This book carries us into one of the newer fields of chemistry, one which covers an enormous ground and is leading to very remarkable results. The radio enthusiasts use bakelite for their panels and other parts, and that is merely one of a vast number of synthetic products which are replacing to a certain extent mica, glass, marble, slate, asbestos, and other every-day natural products. Some familiar things among the many treated will be recognized. Condensite we are familiar with as the substance from which phonograph disks may be made. Amber is an old time friend of the chemist and here we find a substitute for it. The book would be of little use without an index, and it is a comfort to find an index of over forty pages at the end of the treatise.

THE ELECTRON IN CHEMISTRY. By Sir J. J. Thomson, O.M., F.R.S. Hard covers, 6½"x9½", illustrated, 144 pages. Published by The Franklin Institute, Philadelphia, Pa.

Three things may be said of this book. The author is Prof. J. J. Thomson of Cambridge, England, one of the greatest physicists in the world. The lectures were delivered at the Franklyn Institute, Philadelphia, and the subject is the "Electron in Chemistry." It would be presumptuous to review it any further. The author is so eminent a man and the subject is so all-important at the present period, that the book should be read by all who are interested in chemistry and the foundation stones of electricity.

ORGANIC SYNTHESIS. Hard covers, 5¼"x9", 100 pages. Published by John Wiley & Sons, New York City. $1.50.

The old-time house of John Wiley & Sons, with whom all chemists have been for so many years familiar, has undertaken a rather daring task in issuing a book of a hundred pages on the subject of organic synthesis, but everything is so clearly put by the distinguished contributors, and the arrangement is all so compact and systematic, that we warmly recommend it to our chemically disposed readers. To the old-time inorganic analyst this book is especially interesting, as he finds a sort of *terra incognita* treated on the line of groups, such as are the basis of his work with mineral substances.

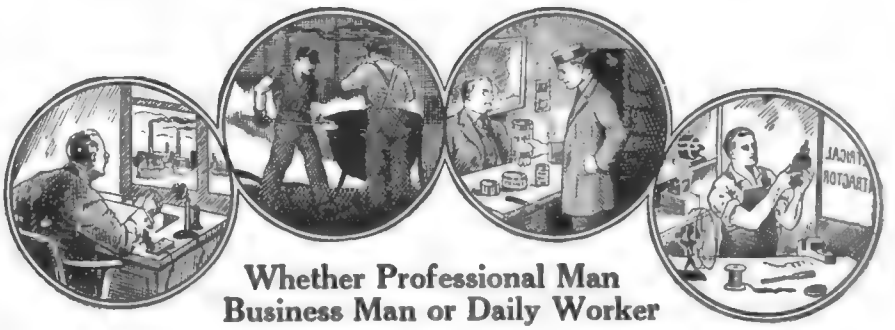
DIE ENTDECKUNG DER HEIMAT. By R. H. France. Hard covers, 5¼"x8", 77 pages, illustrated. Published by Kosmos, Stuttgart, Germany.

The discovery of the home which may be taken as a translation of the title of this book, leaves us rather puzzled as to the subject, but it turns out to be a general review of Mother Earth, who certainly is our home for the present, and is gotten up in the very attractive style of the Kosmos books. The Germans certainly have the talent of producing books of this character with illustrations rather picturesque than elegant, and which tell the story so very well. An index gives the German names of animals and plants from the text, and over two pages are required to give these names in double column, which gives a clue to the thoroughness of the little manual.

VON KLEIDUNG UND GEWEBEN. By Hans Wolfgang Behm. Hard covers, 5¼"x8", 75 pages, fully illustrated. Published by Kosmos, Stuttgart, Germany.

This is a book on clothing, and its first picture shows a number of people of dark complexion and certainly not very good examples of clothing. This, however, does not last long, and we find ourselves soon presented with the highly picturesque and elaborate Cypriote costume. Bark cloth is spoken of, the plants which supply fibres, the spinning of fibres, and the treatment of flax are all treated at some length.

No Matter What Your Vocation



Whether Professional Man
Business Man or Daily Worker

A Thorough Training In

CHEMISTRY

Will Help You To Get Ahead

TO be successful today is to know Chemistry! Every line of business, every branch of industry depends upon Chemistry in some form. You may not realize it, but your own proficiency in whatever work you are doing would be increased by a knowledge of Chemistry. In many lines such knowledge is absolutely essential. In others it is a guarantee of promotion and more money.

The keen competition that exists in every commercial activity today requires that a man know all there is to know about his vocation. If you have something to sell—no matter what—Chemistry enters into its makeup. The salesman who knows the chemical composition of his article can talk about it more intelligently than the one who lacks this information, and his sales are proportionately larger. In the building trades Chemistry is of prime importance. The mason, electrician or painter who knows something about Chemistry can do better work and command more money than the one who does not. Through Chemistry a shop-keeper learns how to attract the most trade, and even in clerical positions one can capitalize his chemical skill.

Chemistry should be as much a part of your mental equipment as the ability to calculate or to write correct English. The world is paying a thousandfold more for ideas than for actual labor. The big rewards go to the man who can show how to turn out a little better product at a little lower cost. And Chemistry will give you the ideas that will save money for yourself or your firm in the very fundamentals of your business. There is nothing remarkable about this; it is going on every day. If you have not heard of it before, it is because the general public has been slow to recognize the tremendous value of chemical training. People have been content to leave Chemistry in the hands of a few trained chemists who could not possibly develop the subject to anywhere near its greatest extent.

Now we are on the eve of a great awakening. Our heritage from the World War has been an intense development of the chemical industries in the United States and a tremendous interest in all the applications of Chemistry. People are taking up the subject merely for the good it will do them in their own line of business.

It is no longer necessary to enter college in order to learn this fascinating science. Our Home Study Course trains you just as thoroughly, and with the same assurance of success, as those who took the longer way. And our methods are so simple that we can teach you no matter how little previous education you may have had. Many of our graduates now hold responsible positions or have materially increased their incomes from private enterprises as a result of taking our course. Hundreds of letters from students testifying to the benefits they have derived from our training are here for your inspection.

Remember that you do not need to study Chemistry with the idea of actually practicing as a chemist, although a great many of our students are taking our course with this object in view. If you want to know more about what Chemistry will do for you, if you want to know what our home study course offers, sign and mail the coupon today for FREE BOOK, "Opportunities for Chemists."

Chemical Institute of New York, Inc.
HOME EXTENSION DIVISION 5
66-S West Broadway, New York City

DR. T. O'CONOR SLOANE Will Teach You Chemistry In Your Own Home

The Chemical Institute of New York, of which Dr. T. O'Conor Sloane is Educational Director, was founded to fill the need of ambitious, far-sighted men who realize and recognize the splendid future Chemistry offers them, but who cannot spare either the time or the money to attend college. Dr. Sloane, a foremost authority on Chemistry, will teach you and will give you any individual help you may require. He will personally go over your papers, correct them, point out your faults, teaching you in a practical and interesting way. No special education required other than the ability to read and write English. One student has characterised our lessons as "The course that takes the mystery out of Chemistry."

Read What One of Our Recent Graduates Reports

"I thought I would let you know of my success. I finished your course about two months ago and now have a fine position as chemist at the DuPont Dye Works. I am getting along fine with my work and like it very much. It was through your course alone that I have been so successful. It is wonderful and I hope you have great success with it."
(Name and Address on request.)

Easy Monthly Payments

You do not have to have even the small price of the course to start. You can pay for it in small monthly payments—so small that you won't feel them. The cost is very moderate, and includes everything, even the Laboratory Equipment—there are no extras to buy with our course. Our plan of monthly payments places a chemical education within the reach of everyone.

Laboratory Equipment Given To Every Student Without Additional Charge

We give to every student without additional charge h'. chemical equipment, including forty-two pieces of laboratory apparatus and supplies, and seventeen different chemicals and reagents. These comprise the apparatus and chemicals used for the experimental work of the course.

Special 30-Day Offer

For a short period we are making a special offer that will be worth your while to take advantage of. Write for particulars, using the coupon below or simply a postal card. This will not obligate you in the least. Do not wait until tomorrow. Send the coupon now while you think of it.

Sign and Mail the Coupon for FREE BOOK

CHEMICAL INSTITUTE OF NEW YORK, Inc.
Home Extension Division 5,
66-S West Broadway, New York City

Please send me at once without any obligation on my part, your Free Book "Opportunities for Chemists," and full particulars about the Laboratory Equipment furnished to every student. Also please tell me about your plan of payment and your special 30 day offer.

NAME .....

ADDRESS .....

CITY .....

STATE .....
S &I..5-24

Digitized by Google
Original from UNIVERSITY OF CHICAGO

U.S. PATENTS

SEND FOR THIS FORM

Don't Lose Your Rights

Before disclosing your invention to anyone send for blank form "Evidence of Conception" to be signed and witnessed. A sample form together with printed instructions will show you just how to work up your evidence and establish your rights before filing application for patent. As registered patent attorneys we represent hundreds of inventors all over the U. S. and Canada in the advancement of inventions. Our schedule of fees will be found reasonable. The form "Evidence of Conception" sample, instructions relating to obtaining of patent and schedule of fees sent upon request. Ask for them,—a post card will do.

LANCASTER & ALLWINE

255 OURAY BLDG.,
WASHINGTON, D. C.
"Originators of form Evidence of Conception"

PATENTS

TO THE MAN WITH AN IDEA

I offer a comprehensive, experienced, efficient service for his prompt, legal protection and the development of his proposition.

Send sketch, or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information and form for properly disclosing your idea, free on request. Write today.

RICHARD B. OWEN, Patent Lawyer
164 Owen Building, Washington, D. C.
2276-8 Woolworth Bldg., New York City

PATENTS

Hand books on Patents, Trade Marks, etc., sent free. Our 78 years of experience, efficient service, and fair dealing assure fullest value and protection to the applicant. The Scientific American should be read by all inventors.

MUNN & CO.

618 Woolworth Building, New York

Scientific American Building, Washington, D. C.
Tower Bldg., Chicago, Ill.
Hobart Bldg., 582 Market St., San Francisco, Cal.
Van Nuye Building, Los Angeles, Cal.

PATENTS

BOOKLET FREE HIGHEST REFERENCES
PROMPTNESS ASSURED BEST RESULTS
Send drawing or model for examination and report as to patentability

WATSON E. COLEMAN, Patent Lawyer
644 G Street, N.W., Washington, D. C.

In this Department we publish such matter as is of interest to inventors and particularly to those who are in doubt as to certain Patent Phases. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries are published here for the benefit of all readers. If the idea is thought to be of importance, we make it a rule not to divulge all details, in order to protect the inventor as far as it is possible to do so.

Should advice be desired by mail a nominal charge of $1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.

NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.

GASOLINE INDICATOR

(800) Roscoe Cate, Muskogee, Okla., submits a sketch of a gasoline indicator using compressed air to move a column of mercury mounted on the dash of a car, which is graduated for gallons. A piston in a cylinder mounted under the tank holds the gas back and prevents it from flowing into the air supply line.

A. The idea which you have advanced is not new and is very inaccurate. Supposing that we have a gasoline tank as you describe, sealed tightly at the top. In the hot summer days the gasoline evaporates, and consequently we get a higher pressure in the tank. This will mean that the piston, free to move in the cylinder, will be raised higher, compressing the air in the copper tube to a greater extent than normally, and forcing the mercury in the indicator on the dash to rise higher, giving a false reading, but all gas tanks should be supplied with "breather" valves. These could overcome this fault. The copper tube contains a certain quantity of air which changes, expanding and contracting when the atmosphere is heated or cooled. Thus we get a variable effect in the air column alone similar to the action of air-bulb thermometers. The result is that a temperature correction would have to be made. If this copper tube passes beneath the hood near the engine, in order to reach the dash (as that is the only arrangement possible), the heated air, when the engine has been running for some time, will increase the false reading. Coating the copper tube with asbestos, will only partly remedy this fault. Your device cannot be made as an attachment, however, and changing it so that it will become an attachment, may cause it to infringe on another similar device using no valves at all in the system. We frankly believe that your idea is impractical and inapplicable to modern motor cars, and would not suggest applying for a patent on the same.

PHONE CONDENSER

(801) Harry Geduld, New York City, asks if any phone plug has a condenser mounted in it and requests our opinion of the device.

A. To the best of our knowledge, there is no phone condenser patented which is situated within a plug. We do not believe that such a condenser possesses any great merit, as it is just as simple to install the condenser within the set, and leave it there, as it is to insert the same in the plug. In many circuits, it is desirable to eliminate this phone condenser, in which event your plug will be worthless.

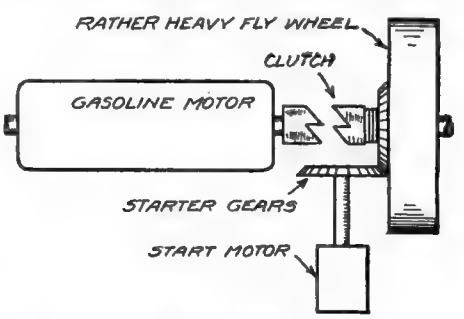
PATENT COPYRIGHT AND TRADE SECRETS

(802) Ernie F. Hiser, San Francisco, Calif., has submitted some fine examples of moving picture films of surgical operations. He asks us whether he should patent the process, keep it as a trade secret, or copyright the method.

A. If you could see your way clear to making the films, similar to those you have forwarded, without patenting the process, we would advise that you do so. As you undoubtedly know, a patent broadcasts your invention, and even though other individuals may be prevented from using the system, there is no possibility of your proving that they have used your principle, and therefore, they could get away with quite a good deal of valuable data. If you find it necessary to have draftsmen or others draw your system, or find it necessary that a doctor or surgeon be at your side while making your photographs, we would advise that you patent those most important processes, and leave the critical systems or portions out of the patent, keeping them as trade secrets. Remember that your trade secrets, if they are learned, will practically "break" you; but if they are retained as your private property, may "make" you. The patent will protect your system and prevent others from using it, provided that you can prove they did so. A copyright will not protect you adequately. The film itself should be copyrighted however, to prevent other concerns from using it as a whole, or in part, and a frame from each new version of the operation, or each scene should be forwarded to the copyright bureaus. The films are very fine indeed, and we wish you the best of success in your venture.

ENGINE STARTER

(803) Milo Housh, Peters, Neb., asks for our advice on a starting device for gasoline motors. An electric motor is to be geared to a flywheel, and when the momentum of the wheel is sufficiently great the clutch is to be thrown, causing



Novel proposed form of auto engine starter.

the flywheel to engage with the shaft of the gasoline motor.

A. We do not think very much of your starter for gasoline motors, for the reason that when the flywheel is rotated at a high speed, the momentum imparted thereby is excessive. Consequently, when the clutch is thrown in in order to start the engine, the jaws of this particular clutch might not engage effectually, but would rip themselves to pieces. The engine could perhaps be started once or twice, and after that a new pair of clutch jaws would be necessary. For this reason, one cannot start up a hill at low speed and swing into high immediately without danger of either stalling the motor or ripping the teeth of the gears to pieces. It is assumed here that the clutch is not constructed to slip and that the gear ratio is high.

CHILLBLAIN REMEDY

(804) Miss Mattie Hoch, Freeland, Pa., asks whether we advise her to develop a chillblain remedy that gives instant relief, and what legal steps she can take to protect the mixture.

A. If your chillblain remedy does what you claim for it, you may rest assured that it will meet with a favorable market if properly exploited. If alcohol is used in its preparation, you will have to secure the proper alcohol permit. A mixture of chemicals cannot be patented as a rule. Therefore, keeping ingredients of the medicine a secret will be your best protection. The name can be registered as a trade mark. You will have to advertise this remedy extensively in order to make it popular.

TO BECOME A PATENT ATTORNEY

(805) A. Halliwell, Cleveland, Ohio, asks whether he can become a patent attorney, and desires to know the qualifications he must have in addition to being a graduate lawyer, admitted to the bar.

(Continued on page 84)

Digitized by Google
Original from UNIVERSITY OF CHICAGO

EXPERIENCE SERVICE

CLARENCE A. O'BRIEN

PATENT ATTORNEY

REGISTERED IN UNITED STATES PATENT OFFICE

MEMBER OF THE BAR OF

SUPREME COURT OF UNITED STATES, COURT OF APPEALS DISTRICT OF COLUMBIA,
SUPREME COURT DISTRICT OF COLUMBIA. UNITED STATES COURT OF CLAIMS.

PRACTICE CONFINED TO PATENTS AND TRADE MARKS.

PATENTS

PROTECT YOUR IDEAS

ANY NEW article, machine, design or improvement thereof, or any new combination of parts or improvements in any known article which increases its efficiency or usefulness, *may be patented,* if it involves invention.

SCIENCE INVENTION INDUSTRY ECONOMY EFFICIENCY INITIATIVE

Drafting and Specification Room of Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

IF YOU HAVE ANY NEW IDEAS

which you feel are useful, practical and novel, *take prompt action to protect your rights.* If you have invented any new machine, or new combination of parts of improvement, or any new design or process, SEND DRAWING, MODEL OR DESCRIPTION of it for information as to procedure to secure protection.

Write Today for Blank Form

"Record of Invention"

USE THE COUPON attached, and immediately upon its receipt I shall send you this form to be returned to me with drawing, description or model of your idea; promptly upon receiving your idea I shall write you fully as to procedure and costs.

No Charge for This Information

All communications are held in strict confidence. My personal, careful and thorough attention is given to each case. I offer you efficient, reliable and prompt service—based upon practical experience. *Highest references.*

WRITE TODAY for free book *"How to Obtain a Patent."* This book will give you valuable information, and it may save you much time and effort. *Send for it, NOW.*

My practice is devoted *exclusively* to United States and Foreign Patents and Trade Marks. Write me freely, frankly and with full confidence; it is very probable that I can help you. *Write TODAY.*

FREE COUPON

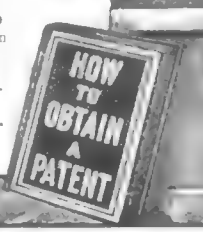
CLARENCE A. O'BRIEN, Registered Patent Attorney, WASHINGTON, D. C.
532 Security Savings & Com'l Bk. Bldg., directly across street from U. S. Pat. Office

Please send me your free booklet, "How to Obtain a Patent" and blank form "Record of Invention" without any obligation on my part.

Name .....

Address .....

(IMPORTANT: WRITE OR PRINT NAME CLEARLY)



Digitized by Google

Original from UNIVERSITY OF CHICAGO

Ennion's Idea

TWENTY centuries ago a Sidonian craftsman inscribed on a drinking glass he had made, these words: "Made by Ennion, let the buyer remember." This is said to be the first advertisement.

To-day, every manufacturer who is really proud of his product, marks it, that all may know and identify his work. Then, by advertising, he throws on both product and mark the search-light of public attention.

Only good goods, fairly priced, can flourish in the light of advertising. *The goods must be as advertised.* Otherwise, they lose caste in the buyer's mind. And no business can thrive under the weight of public condemnation.

That is why a manufacturer places the reputation of his business at stake every time he advertises. He spends his money to invite your consideration of his wares, and then, perforce, must leave the final decision to you.

And that is why it pays to be guided by advertising and to buy advertised goods.

Read the advertisements

INVENTORS PROTECT YOUR IDEAS

Send for our Guide Book, **HOW TO GET A PATENT,** and Evidence of Invention Blank, sent Free on request. Tells our terms, methods, etc. Send model or sketch and description of your invention and we will give our opinion as to its patentable nature.

Name .....

Street .....

City .....State.....

RANDOLPH & CO.
Dept. 172, WASHINGTON, D. C.

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

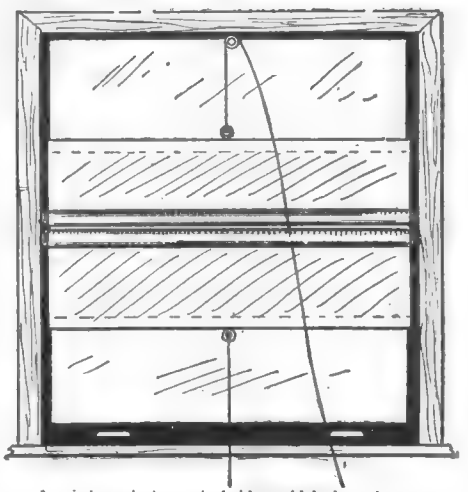
Patent Advice

(*Continued from page 82*)

A. If you can bring testimonial proof that you have worked for a patent attorney, and have prosecuted a certain amount of cases yourself, we believe that you will have no difficulty in convincing the patent authorities that you have the necessary qualifications for rendering valuable service to applicants for patents. Proof of your service with an attorney and your prosecution of several cases is quite sufficient.

WINDOW SHADES

(806) J. W. Humphreys, Los Angeles, Calif., asks whether we would advise him to apply for a patent on a window shade, which is divided so that two rollers are at the middle of the window frame and each half of the shade is controlled separately.



A window shade control idea which is not new.

A. The suggestion which you have advanced for design in window shades is very old. In many homes in New York, as well as in many public schools, this principle is employed.

We are sure a patent would not be granted on the suggestion.

PUZZLE

(807) R. Henkel, Ft. Wayne, Ind., submits a model of a tube and bent-wire puzzle, in which the problem is to separate the pieces.

A. It is relatively easy to secure a patent upon a puzzle, but very difficult to obtain some financial backing, after the puzzle has once been patented, unless the puzzle is a good one. We doubt if you can make this puzzle popular.

The device is not puzzling at all, the writer having solved the same long before your letter accompanying it reached this office, and was able to take it apart and put it together within a two second examination.

We do not believe that a patent upon this idea would be profitable, and consequently would not suggest that you apply for one.

DECIMAL CLOCK

(808) John M. Jensen, Jamestown, N. Y., requests our advice on a clock dividing the day into ten hours, the hour into ten minutes, the minute into ten seconds, the second into ten periods, and the period into ten thoughts.

A. The question is not whether you will be granted a patent on your system, but whether or not the people will look at your idea of a clock with favor. Dividing the day into ten hours, the hour into ten minutes, the minute into ten seconds, etc., will not only completely change modern methods of calculation, but make this calculation absurd. The clock today bears a distinct relation to astronomical movements, that is the reason it is divided as at the present time. Your change would, under no circumstances, be looked upon favorably by individuals in the United States.

METAL VIOLIN

(809) Theo. Hansen, Galveston, Texas, requests our opinion of a metallic violin.

A. The front and back of a violin could be removed and replaced with aluminum. This violin will give out a considerable volume of sound, perhaps equal to the volume of the ordinary wood violin, but the sound of the same will be very metallic. We doubt very much if the harmonics produced by such a violin would exhibit any of the natural fineness of the wooden instrument.

Of course such a model could be used for practising, but we doubt if it would take the place of the ordinary skeleton violin. The metal will always have a certain coldness, perhaps even act as a condenser of moisture, which the skeleton violin does not do. Further, this metallic violin would have to be protected to a greater extent than the skeleton. A man traveling with the skeleton will pack it in his trunk, or throw it in

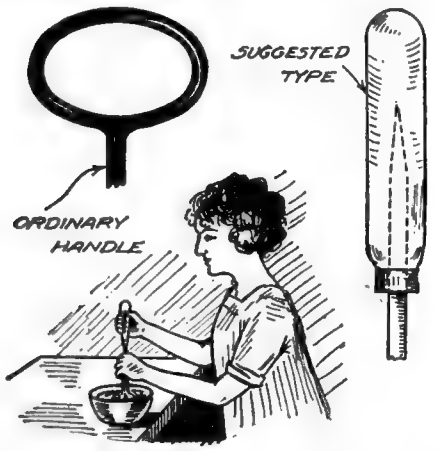
Digitized by Google
Original from UNIVERSITY OF CHICAGO

a corner somewhere, and not think of it again until he has to practise. A metal violin on the other hand, would have to be kept in a case, otherwise it would be dented and damaged.

We doubt if your proposition would meet with very great favor, although a few of these instruments could undoubtedly be sold, if sold cheaply.

EGG BEATER HANDLE

(810) Mr. Charles A. Huntington, W. Somerville, Mass., asks our opinion of a handle for egg beaters, made as illustrated.



Egg beater handle idea proposed for patenting.

A. We do not think very much of your egg beater handle design. The handle of the egg beater does not appear to constitute matter for a patent, inasmuch as your handle does not show any marked improvements over handles of the same kind, used for tools.

Neither do we believe that the device will of its own accord present any marketable value over egg beaters having a cast iron circular handle. We, therefore, would not suggest placing the same on the market, and we do not believe that a patent could be obtained on the idea.

PRIORITY

(811) George C. Halkins, New York City, asks for information concerning inventor's methods of establishing priority, and asks about caveats.

A. With reference to precautions taken by inventors, we would suggest that plans or drawings are not registered. Years ago caveats were given to inventors, which established legal claims of priority. Today the best an inventor can do is to fight for priority. The inventor can build a model, show it to as many friends as possible, and every time a friend sees the same, his name should be signed in a book as well as the date of seeing the same. Be sure to explain the invention to everyone, and have them testify that they understand how the device is to work. Then place full specifications, typewritten manuscript, etc., in an envelope, seal this on the back, front and sides, so that in no manner can the envelope be opened, without breaking the seals, and mail it to yourself, and then carefully tuck it away in your safe. This should be one complete set of specifications of a triplicate, another copy should be on your files, and a third copy should be sworn to before a Notary Public, to which the names of those who have seen it, as well as the dates, should be attached. If photographs are made of the device, further security is guaranteed by having the photos sworn to before a Notary. It is advisable to have the photo made on a paper larger than the actual print, so that the Notary Public's signature and seal can be placed on the paper of the photo. These photos may be distributed to some of your well-known friends, asking them to keep the same on file, and to send you a letter stating that they had received the photo. Any detail worked out on paper establishes no claim whatever, either to priority or to a well protected patent. It is necessary in order to secure a broad claim that an actual working model be built. Even the patent upon the invention is not an absolute surety, providing the inventor has patented the device and made no attempt at building either a model or a complete practical device. The making of this model automatically gives a very solid legal claim. In court cases the device reduced to practice, receives preference.

FLEXIBLE WIRE REEL

(812) Henry Herbert, Independence, Kansas, asks whether he should try to patent a reel for electric light cord.

A. The idea which you have advanced, namely, a reel for electric light cord, is not new at all. Devices of this nature have been upon the market for a great many years, but do not seem to meet with any great degree of favor.

PATENTS TRADE-MARKS AND COPYRIGHTS

OUR OFFER: No Charge for Examination and Instructions

YOUR FIRST STEP

Before disclosing an invention the inventor should write for our blank form *"Record of Invention."* This should be signed and witnessed and returned to us together with model or sketch and description of the invention for examination and instructions. *No charge for the above information.*

Our Three Books Mailed Free to Inventors

Our Illustrated Guide BOOK

How to Obtain a Patent

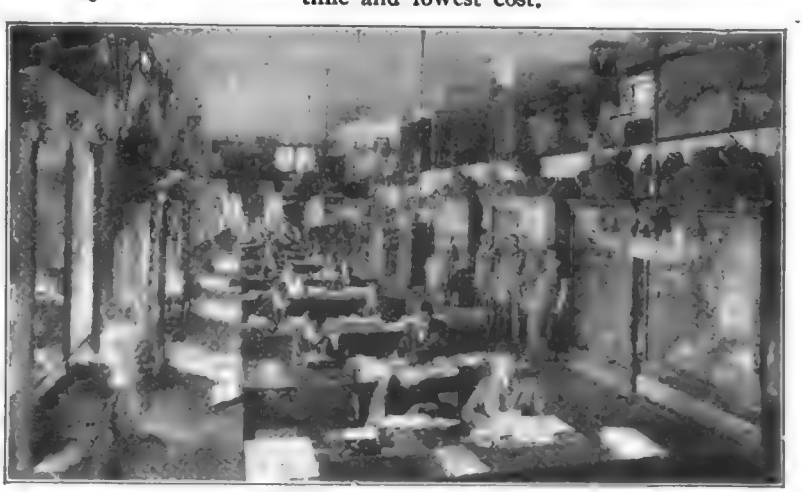
Contains full instructions regarding U. S. Patents. Our Methods, Terms, and 100 Mechanical Movements illustrated and described, Articles on Assignment or SALE OF PATENTS, Patent Practice and Procedure, and Law Points for inventors.

Our Trade Mark Book

Shows the value and necessity of Trade-Mark Protection and gives information regarding *Trade-Marks and unfair competition in trade.*

Our Foreign Book

We have Direct Agencies in all Foreign Countries. We secure Foreign Patents in shortest time and lowest cost.



Specification and Drafting Departments, Victor Building

WE REGARD A SATISFIED CLIENT

As our best advertisement, and will furnish to anyone, upon request, lists of clients in any state for whom we have secured patents.

Highest References—Prompt Attention—Reasonable Terms

WRITE TODAY

Free Coupon

VICTOR J. EVANS & CO.

Patent Attorneys

New York Offices 1007 Woolworth Bldg. Philadelphia Offices 714-715 Liberty Bldg. Pittsburgh Offices 514 Empire Bldg. Chicago Offices, 1114 Tacoma Bldg. San Francisco Offices, Hobart Bldg.

Main Offices, 779 Ninth Street, Washington, D. C.

Gentlemen: Please send me FREE OF CHARGE your books as described above.

Name ..... Address .....

Digitized by Google Original from UNIVERSITY OF CHICAGO

One of the 7 Big Laboratories at School of Engineering of Milwaukee

BECOME A MASTER ELECTRICIAN
in One Short Year

or learn an electrical trade in three to six months. Greatest of all professions open to you. "Forty billions will be invested in Electricity in next five years," says Edison. Salaries are high. Demand for TRAINED electricians ENORMOUS. Think of electric lighting, electric street cars, electric railway trains, electric telephone and telegraph, electric motors, electric automobiles, electric cooking and heating. Electricity in the air and under the sea. Is it not dazzling?

Mail This Coupon Today—Right NOW

School of Engineering of Milwaukee,
Dept. M-102, 415 Marshall St., Milwaukee, Wis.

Without obligating me, please furnish details of course (or courses) marked below:

[ ] Master Electrician, 6 months to 1 year.
[ ] Electrotechnician, 12 to 30 months.
[ ] Electrical Engineering, B.S. Degree, 3 years.
[ ] Commercial Electrical Engineering, 12 months
[ ] Automotive Electricity, 3 to 6 months.
[ ] Armature Winding and Motor Generator Repair Course, 3 to 6 months.
[ ] Electrical Home-Study Training with laboratory facilities to those who cannot come to Milwaukee.

Name .....
Street .....
City .....State .....
Age .....Education .....

New Uncrowded Field

Our large staff of professors of the four departments teach the laws and principles of electricity. Actual training in laboratories; lectures and practice. No special schooling required to enter our practical electrical, electrotechnician and trade courses.

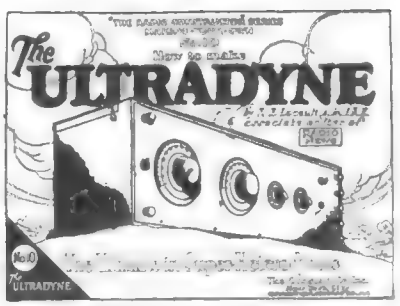
Earn While You Learn

"Earn While You Learn" if you wish. We arrange half-time employment that will help you defray expenses. Lakeside advantages. Board and room reasonable. Daily broadcasting WIAO. School orchestra. Fraternities. Wonderful co-operation between student and instructor.

FREE catalog explains in full. Send for it.

SCHOOL of ENGINEERING of Milwaukee

415 Marshall St. M102 Milwaukee, Wis.



CONSRAD
PATTERN No. 10

THE ULTRADYNE

This receiver is the last word in improved Super-Heterodynes. It employs six tubes and is, without doubt, the most sensitive circuit in existence at the present time. It engages what has been called the "Modulation System" of rectification in place of the usual "Frequency Change" of the received radio currents as in the standard Super-Heterodyne.

The description of this Pattern is written by R. E. Lacault, assistant editor of RADIO NEWS, who devised the Ultradyne; thus, the constructor can feel assured that he is following authentic data.

Complete instructions given in a four-page pamphlet, one large blue print Pattern showing Perspective Wiring Diagram, Coil Winding Forms, Full Size Panel Layout and details for building a cabinet. Contained in a heavy two-color printed envelope. Size 9x12 inches.

PRICE 50c PREPAID

OTHER "CONSRAD" PATTERNS

No. 1. How to Make a Short-Wave Regenerative Receiver.
No. 2. How to Make Detector and Amplifier Units and Supplement—How to Make a Two Step Amplifier.
No. 3. How to Make a Radio-Phone Crystal Set.
No. 4. How to Make a Reinartz-Receiver.
No. 5. How to Make a Reflex Receiver.
No. 6. How to Make a Cockaday Receiver.
No. 7. How to Make a Neutrodyne Receiver.
No. 8. How to Make an Autoplex Receiver.
No. 9. How to Make the S.T.100 Receiver.
No. 10. How to Make the Ultradyne.
No. 11. How to Make a five Tube Cockaday Receiver.
Packet A. Radio Map of the U. S. on Cloth.
Packet B. 20 Radio-Phone Diagrams and 4 Supplements.
Packet C. All About Aerials and Their Construction.
Packet D. 14 Radio Formulas and Diagrams.
Packet E. Radio Amateurs Practical Design Data.

THE CONSRAD COMPANY
Publishers and Sales Agents

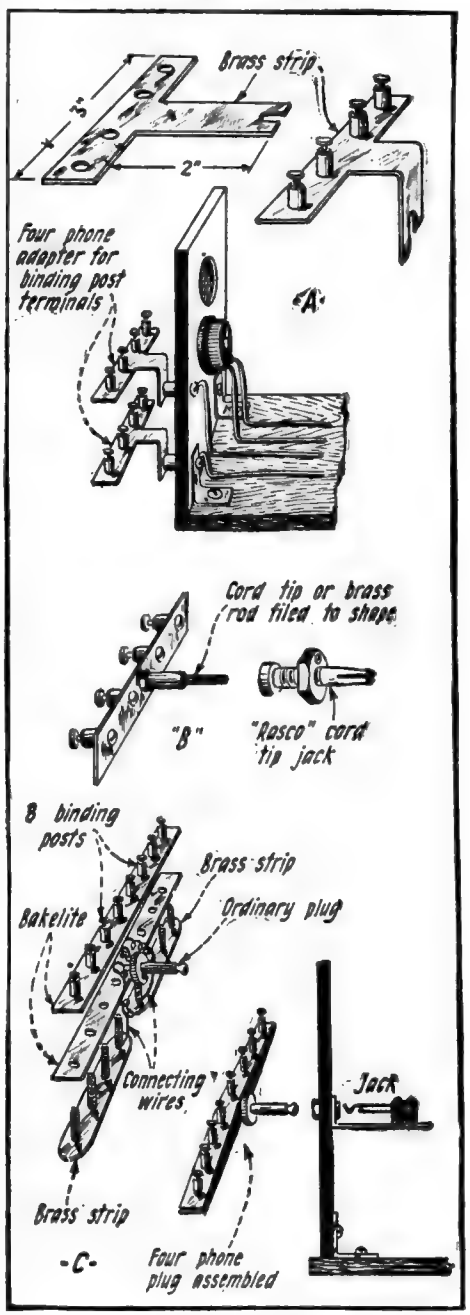
233 FULTON STREET NEW YORK CITY

RADIO WRINKLES

EDITED BY
A. P. PECK,
Associate Member Institute Radio Engrs.

UNDER this heading we are going to publish items of interest to everyone who likes to build radio instruments. In order to continue this department it is necessary for our readers to tell us about their latest experiments. Write us a short description of some time- or money-saving kink you have discovered and send it to us along with a few sketches. Our regular prizes will be paid for this material. Be brief and try to put everything in the drawing. Don't be too elaborate. Address "RADIO WRINKLES" editor, care of Science and Invention.

MULTIPLE PHONE PLUGS

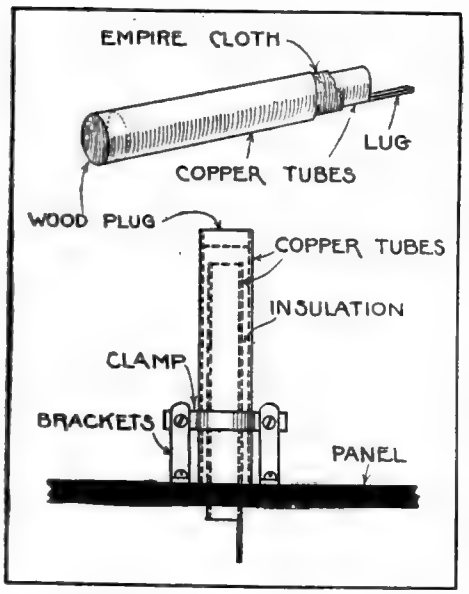


Several ideas for making phone attachments for radio sets so that several pairs of phones may be used are shown above. If binding posts are provided on the set for the attachment of the phones, a multiple phone adapter may be made from two pieces of brass strip as shown at A. Where phone-tip jacks are used, it will be necessary to make two adapters of the type shown at B. For a standard jack, an adapter is made of brass strips and pieces of bakelite which are assembled on a plug as shown at C.

—J. T. Garrer.

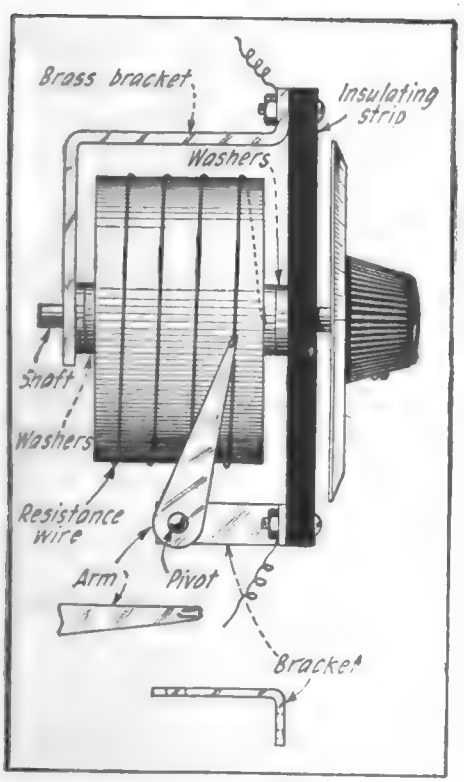
Digitized by Google
Original from UNIVERSITY OF CHICAGO

VARIABLE GRID CONDENSER

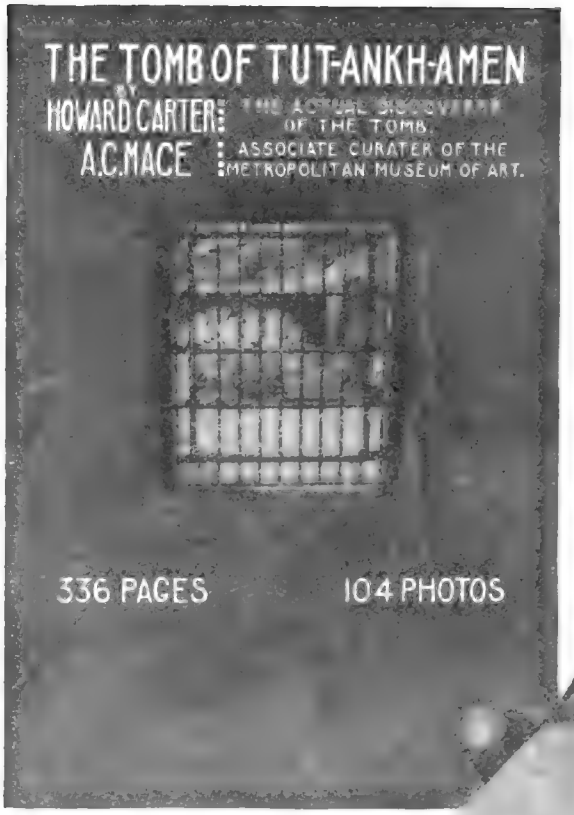


Two telescoping copper tubes and a piece of empire cloth or other insulating material make a very efficient and easily constructed grid condenser. First, wrap enough of the empire cloth around the smaller tube so that it will fit snugly in the larger tube. Connections are then made to each of the metallic electrodes. A mounting is suggested in the lower part of the above illustration. The connection to the inner electrode can be brought out through the wooden plug. —Leroy Western.

A VERNIER RHEOSTAT



An excellent vernier rheostat can be made by following the above illustration. The first section of two-inch insulating rod is cut to the desired length and wound with several turns of resistance wire. This drum is then fastened to a shaft soldering one end of the resistance wire to the shaft. A suitable mounting is then provided and a pivoted arm arranged as shown. The end of the arm is bent slightly so that as it rests on the wire and the drum is turned, the arm will follow the convolutions. —Leo Carble.


THE TOMB OF TUT-ANKH-AMEN
BY
HOWARD CARTER: THE ACTUAL DISCOVERER OF THE TOMB.
A.C.MACE: ASSOCIATE CURATOR OF THE METROPOLITAN MUSEUM OF ART.
336 PAGES
104 PHOTOS

—behind these doors Howard Carter found the most precious treasures ever revealed to modern man.

Everywhere
The Glint *of* Gold

"With trembling hands I made a tiny breech. . . I inserted the candle and peered in. At first, I could see nothing, but presently, as my eyes grew accustomed to the light, details of the room within emerged slowly from the mist, strange animals, statues, and gold—everywhere the glint of gold!

"For the moment—an eternity it must have seemed to the others standing by—I was struck dumb with amazement!"—Howard Carter, in THE TOMB OF TUT-ANKH-AMEN.

"THE IMAGINATION FALTERS"

Did you know that Howard Carter, under the direction of the late Earl of Carnarvon, had been searching for this particular tomb throughout six years of failure and disappointment and that the spades had just touched the ground in one last despairing effort when they found four buried rooms of dazzling splendor far exceeding their wildest dreams, and that in all history this was the first unmolested Egyptian tomb disclosed to modern man?

DON'T MISS THIS BOOK

AUTHENTIC STORY

Here, at last, is the first authoritative account of the most remarkable discovery of the age, written in simple, vivid, understandable English, by Howard Carter, the one man who could write it, in collaboration with Mr. A. C. Mace, Associate Curator of the Metropolitan Museum of Art, New York. The price for this complete amazing work is only $5.00. It is the chance of a lifetime to learn of the great wonders of Egypt.

SCIENCE & INVENTION,
Book Department,
53 Park Place,
N. Y. City.

Gentlemen:

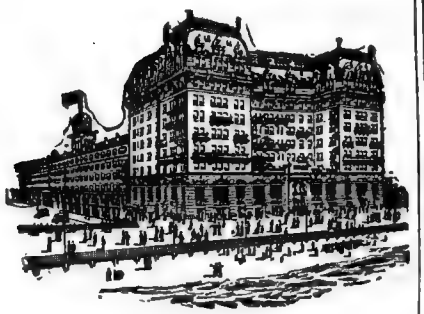
Send me by return mail one copy of THE TOMB OF TUT-ANKH-AMEN. I will pay postman the price of $5.00 upon delivery.

Name .....

Address .....**State** .....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Capacity, 1,000



The Breakers

Atlantic City, N. J.

ON THE OCEAN FRONT

Fireproof

American and European Plans

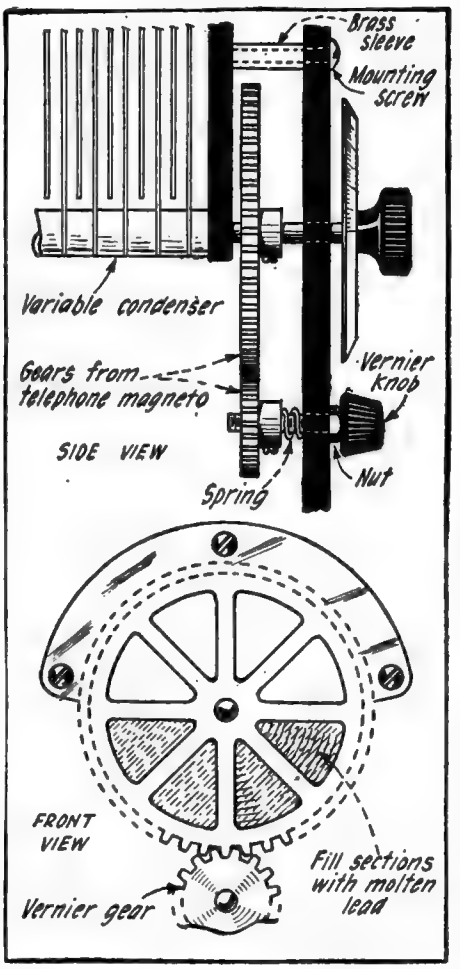
Orchestra *Dancing*

Golf Privileges *Cabinet Baths*

Garage

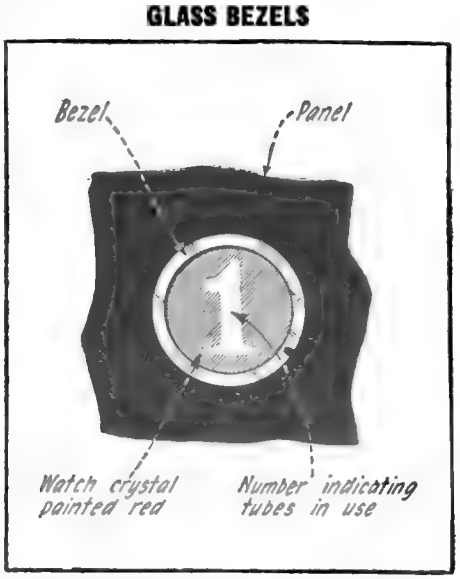
JOEL HILLMAN, *President*

GEAR VERNIER



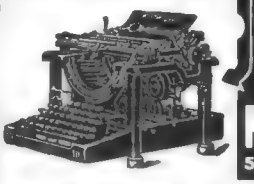
By removing the two gears from a standard telephone magneto and mounting the large one on the shaft of a condenser and the small one directly below, an excellent gear controlled vernier will result. It will be found necessary to mount the condenser away from the rear of the panel so as to allow space for the gears and this is done by placing a ¾-inch section of brass tubing over each one of the mounting screws. In order to counter-balance the weight of the variable condenser plates, a section of the large gear may be filled with lead, as illustrated. This will effectively prevent the condenser from changing its position after it is once set. The portion filled in with lead should be placed at the bottom when the condenser is at full capacity, taking for granted that the condenser is mounted as shown in the lower part of the above illustration. —H. R. Francis, Jr.

GLASS BEZELS



A very neat appearing decoration for the panel of a receiving set may be made by placing watch crystals in standard bezels and painting the glass red. Before painting, outline the number of the tube in front of which the bezel is to be placed and paint all around it. Use the abbreviation DET. for detector and figures to denote the number of stages of amplification in use.—E. S. Valentine.

SEND NO MONEY
5 DAYS FREE TRIAL



"INVINCIBLE" Rebuilt GUARANTEED STANDARD No.10 Self Starter Model REMINGTON

A real bargain. All late improvements—84 characters, standard type, back spacer, etc. As near new in appearance and operation as modern methods and expert mechanics can produce. Many other standard makes. Time payments if desired. Shipments from nearest of our 29 stores. Order now or write for circular. Resident salesmen wanted.

American Writing Machine Co.

Established 1880

Factory, 458-R Central Ave., Newark, N. J.

FORD RUNS 57 MILES ON GALLON OF GASOLINE

A new automatic and self-regulating device has been invented by John A. Stransky, 2314 Fourth Street, Pukwana, South Dakota, with which automobiles have made from 40 to 57 miles on a gallon of gasoline. It removes all carbon and prevents spark plug trouble and overheating. It can be installed by anyone in five minutes. Mr. Stransky wants agents and is willing to send a sample at his own risk. Write him today.—Adv.

BLANK CARTRIDGE PISTOL

Protection against Burglars, Tramps, & Dogs

PRICES 50c. $1.00 POST-PAID

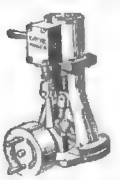
Well made and effective; modelled on latest type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver, without danger to life. It takes standard .22 Cal. Blank Cartridges obtainable everywhere. Price 50c. Superior quality $1.00 postpaid. Blank Cartridges, by express, 50c per 100.

JOHNSON SMITH & CO, Dept. 114 Racine, Wis.

EARN MONEY AT HOME

YOU can make $15 to $60 weekly in your spare time writing show cards. No canvassing or soliciting. We instruct you by our new simple Directograph System, supply you with work and pay you cash each week. Write today for full particulars and free booklet.

WEST-ANGUS SHOW CARD SERVICE LIMITED
Authorized Capital $1,250,000.00
67 Colborne Building, Toronto, Can.



MODEL SLIDE VALVE MARINE ENGINE—
½" bore, $12.75, or ⅝" bore, $15.75
You will probably wish to make your own model boat hull, but what about your power unit? We are builders of working model engines and boilers of many types. We can supply you with a power unit that will meet the requirements of your particular model boat. Boiler, Ship and Naval fittings. Special work. Large illustrated catalogue, 20c.
BATHE MFG. CO.
Dept. 2, 5214 Woodland Ave., Phila., Pa.

5 Master Keys

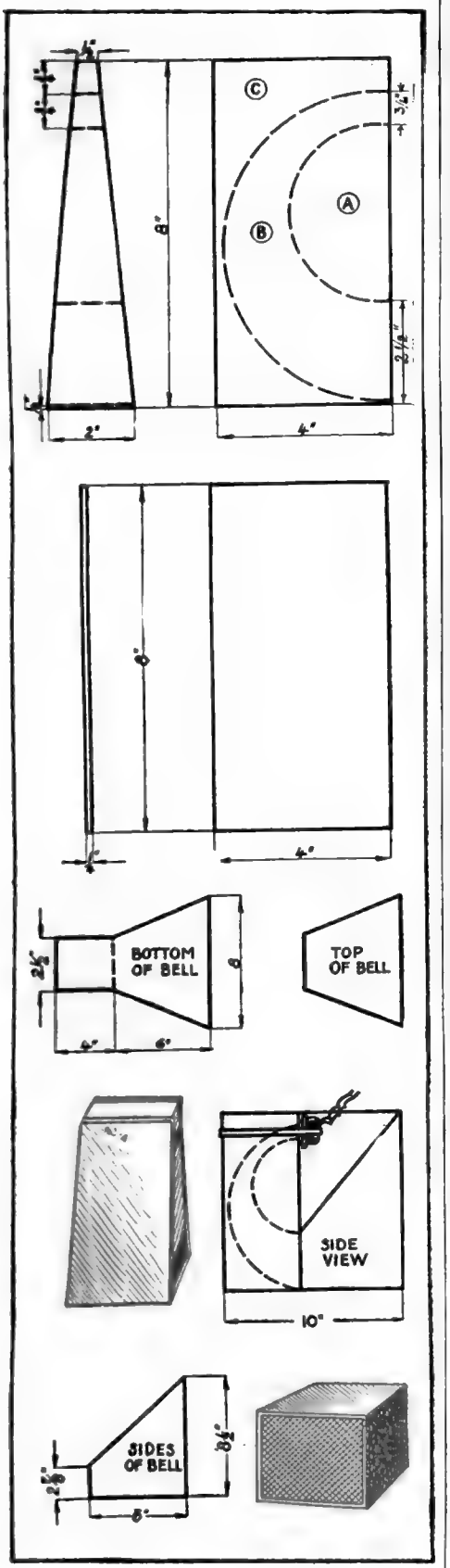
Work like magic in emergencies or prove whether your door or padlocks are burglar-proof. Open and test thousands of different locks. Recommended by users in ten different nations. Most wonderful and only keys of their kind. Send $1 today. Novel key chain FREE, with set.
MASTER KEY MFG. CO. West Water St., Milwaukee, Wis.

MASTER ELECTRICITY AT HOME

I OFFER YOU THE FOLLOWING:
My Personal Attention.
87 Lessons on Electricity.
Slide Rule or Practical Electrical Outfit.
Slide Rule Course.
Radio Course.
"Tele-Draft."
Drafting Course.
Burgess "Blue Book"
Gold "Burgess Service" Button.
Consultation Service.
Purchasing Service.
Opportunity to Earn While You Learn.
No Outside Studies Required.
No Time Limit.
Diploma.
Membership in I. E. A.
Employment After Graduation.
Service to Graduates.
Monthly Payments.
PRICE, $60.00 FOR ALL THE ABOVE.
No Extra Charges.
AND, START ANY TIME—STOP ANY TIME.
Write for my catalog.
YORKE BURGESS, President
BURGESS ELECTRICAL SCHOOL
Dept. 5—745 E. 42nd Street, Chicago, Ill.
Canadian Branch, 210E-Crawford Ave., Toronto.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

LOUD TALKER HORN

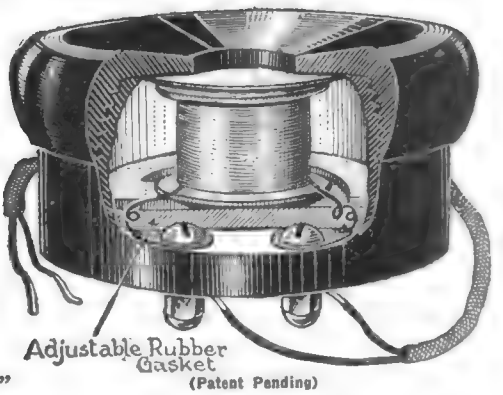


To construct this efficient loud talker horn, obtain an 8-inch piece of 2"x4" lumber and taper it, as shown at the top of the above illustration. Now, with a thin saw, cut out the part B and nail C and A together with two pieces of one-quarter inch wood, 4x8 inches. Next cut the top and the bottom of the bell from the same kind of wood adhering to the figures shown. Make the assembly as illustrated, enclosing the entire unit in a suitable box, after fastening a loud speaker unit to the end of the horn, as shown. A piece of gauze can be fastened over the mouth of the box to give it a finished appearance.

—R. J. Harris.

Announcing the "GEMPHONE"

the DOLLAR 1000 ohm *ADJUSTABLE* PHONE



(Patent Pending)

Don't judge the "GEMPHONE" by its price. It is the cheapest radio phone on the market but its exclusive features place it in a class by itself. Its performance, the clarity and volume of sound reproduction, the faithfulness with which it reproduces radio broadcasting and code, the exquisite quality of tone together with a remarkably loud and clear volume, make it the equal to, and in many cases the superior of, phones at three and four times its price.

The "GEMPHONE" is of standard type and made of the very best grade of materials throughout. It is adjustable—one set screw enables you to adjust the phone to secure perfect reception under any condition.

The case is made of turned wood, an exclusive feature with the "GEMPHONE." This feature is responsible for its exceptionally rich and mellow tone.

The "GEMPHONE" is sold unassembled. The coil is wound to 1000 ohms—all you need to do is to place the parts into the case, tighten up the adjusting screw and connect the terminals and cord. Our instruction pamphlet shows how to assemble it in two minutes, using only a screw driver.

$1 *with 3 ft. Cord* **$1**
Shipping Charges Prepaid to any point in the U. S.

This Complete Radio Receiving Set

Consisting of Radiogem Gemphone and Aerial

$2.50

(Patented Jan. 8, 1924)

This outfit is absolutely complete. It includes everything you need to hear the Broadcast Programs, market reports, time signals, ship calls or land station messages. Nothing more to buy—no batteries or tubes needed—no upkeep of any kind.

The simplest radio outfit made—yet as practical as the most expensive. A crystal receiving set that you can operate and enjoy even though you know absolutely nothing about radio. You receive the RADIOGEM unassembled, together with a clearly written instruction book, which shows you how to quickly and easily construct the set, using only your hands and a scissors. The instruction book explains simply and completely the principles of radio and its graphic illustrations make the assembling of the RADIOGEM real fun.

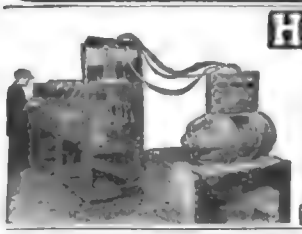
Price of Radiogem without phone or aerial, $1.00

Order Direct or From the Following Dealers:

Boston, Mass.
Farley & MacNeill
Brooklyn, N. Y.
D. S. Qualey
J. G. McCrory Co.
Weber Talking Mach. Co.
Burlingame, Cal.
Harold Cooley
Buffalo, N. Y.
C. B. Auto Motor Accessories
Capetown, South Africa
H. J. Williams
Chicago, Ill.
Barawik Co.
Home Supply Co.
Cleveland, Ohio
Anderson Elec. Co.
Service Publishing Co.
Dallas, Texas
Cullum & Boren Co.
Emmitsburg, Md.
Maryland State Adv. Service
Gary, Ind.
Tribe of K
Grand Rapids, Mich.
Specialty Sales Bureau
Hamilton, Ohio
W. Hoffmeister
Hawera, New Zealand
H. H. Blake
Jersey City, N. J.
Maizie Music & Radio Shop
Los Angeles, Cal.
Lester's Radio Shoppe
Lynn, Mass.
E. C. Woodman Co.
Media, Pa.
Media Elec. Co.
Melbourne, Australia
Marks & Abrahams, Pty. Ltd.
Mesquite, Texas
L. Harbin
New Haven, Conn.
Crawford-Plummer, Inc.
New York City, N. Y.
Conrad Co.
Radio Specialty Co
Standard Distributing Co.
Norfolk, Va
F. J Sawyer
North Plainfield, N. J.
J B Cisco
L. Z. Weiss Drug Store
Northampton Mass
Parsons Elec. Shop
Omaha, Neb.
R. M. Shiaes Co.
Oregon City, Ore.
Singer Hill Radio Service
Pullman, Wash.
Elec. Supply Store
Rew, Pa.
R B Rupert
Rockland, Mass.
D & H Motor Co.
Saginaw, W S. Mich.
J. A Loubert & Co.
Scranton Pa.
Haywood Tire Surgery
Seattle, Wash.
Frank B. Wilson
Springfield, Ohio
Moore Sales Service
Syracuse, N. Y.
Syracuse Supply Co.
Toronto Ont., Canada
M Manus
Washington, D. C
J. T Smyth

THE RADIOGEM CORP., 66-S-West B'way, N. Y. City

DEALERS—Write for Prices and Circulars.



HB 8 HOUR Battery Charging Pays Big Monthly Profits

HB 8 Hour Battery Charging makes $150 to $300 monthly. Draws trade, beats competition. HB outfit comes complete, ready to operate, for small cash payment. Easy $20 monthly terms let your increased profits pay balance. 30 days' trial on money back guarantee. An HB saves time, labor, current—is simple, dependable. Saves you $35 to $115 on first cost alone over others.

Write for Bulletin 520.

HOBART BROS. CO. Box 85 Troy, Ohio

Pays For Itself ~ Earns Big Profits

Insure your copy reaching you each month. Subscribe to Science and Invention —$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Digitized by Google Original from UNIVERSITY OF CHICAGO

"I'm Going to Make More Money!"

"I'm tired working for a small salary. I know I have just as good a head on me as Fred Moore and Bob Roberts, for we used to work side by side. But they've gone far ahead of me.

"Why? Because they saw the value of special training, and I didn't.

"But I know better now. If the International Correspondence Schools can raise the salaries of men like Fred Moore and Bob Roberts, they can raise mine, too!"

"If they have helped others to advance, they can help me. To-day—right now—I'm going to send in this coupon and at least find out what the I. C. S. can do for me."

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6237-C, Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject *before* which I have marked an X:

BUSINESS TRAINING COURSES

☐ Business Management	☐ Salesmanship
☐ Industrial Management	☐ Advertising
☐ Personnel Organization	☐ Better Letters
☐ Traffic Management	☐ Show Card Lettering
☐ Business Law	☐ Stenography and Typing
☐ Banking and Banking Law	☐ Business English
☐ Accountancy (including C.P.A.)	☐ Civil Service
☐ Cost Accounting	☐ Railway Mail Clerk
☐ Bookkeeping	☐ Common School Subjects
☐ Private Secretary	☐ High School Subjects
☐ Spanish ☐ French	☐ Illustrating

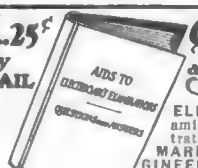
TECHNICAL AND INDUSTRIAL COURSES

☐ Electrical Engineering	☐ Architect
☐ Electric Lighting	☐ Blue Print Reading
☐ Mechanical Engineer	☐ Contractor and Builder
☐ Mechanical Draftsman	☐ Architectural Draftsman
☐ Machine Shop Practice	☐ Concrete Builder
☐ Railroad Positions	☐ Structural Engineer
☐ Gas Engine Operating	☐ Chemistry ☐ Pharmacy
☐ Civil Engineer	☐ Automobile Work
☐ Surveying and Mapping	☐ Airplane Engines
☐ Metallurgy ☐ Mining	☐ Agriculture and Poultry
☐ Steam Engineering ☐ Radio	☐ Mathematics

Name.....
Street Address..... 8-3-24
City..... State.....
Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

1.25 By MAIL

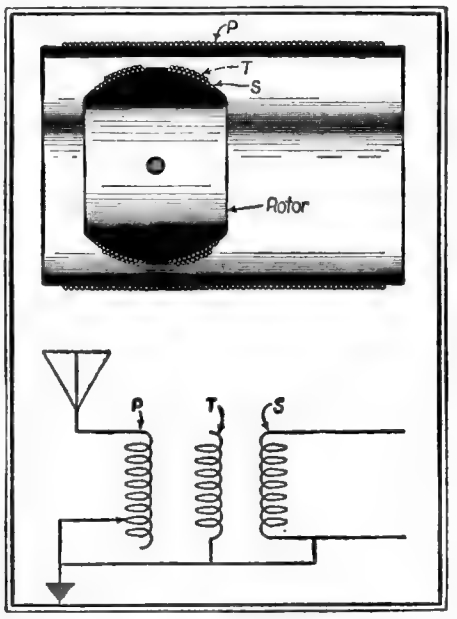


QUESTIONS and ANSWERS

ELECTRICIANS—aid to examination for license. Illustrations, diagrams, tables, etc.
MARINE & STATIONARY ENGINEERS—Latest answers to questions asked at examinations; profusely illustrated. Price $2.50.
STEAM BOILERS—Construction, care and operation. 170 illustrations; complete and valuable information. Price $2.50.
CATECHISM OF STEAM, GAS & ELECTRIC ENGINEERING—Over 1,000 questions and answers. Price $2.00. All books written in simple, concise English by expert authorities.
READE PUB. CO., 296 BROADWAY, N. Y. CITY

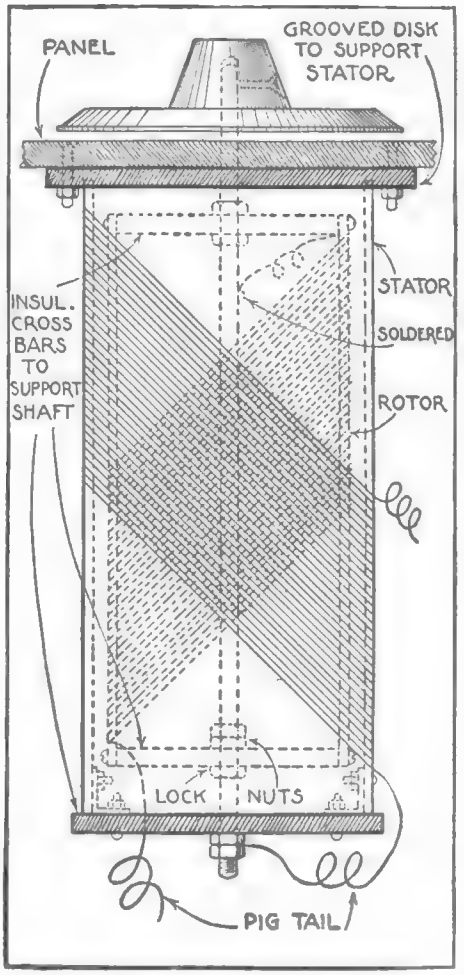
Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

VARIO-COUPLER KINK



An excellent idea to be used in the construction of vario-couplers is illustrated above. The addition of a third winding, T, reduces body capacity and sharpens tuning. The winding should be placed on the coupler as shown and a few turns more or less used until the correct winding is obtained. The addition or subtraction of turns should be done while the set is in operation. The third winding has only one connection. —Harry Ackerson.

NOVEL VARIOMETER



A variometer which embodies most of the good points of the standard variometer and eliminates some of the bad points is illustrated above. The coils are wound on cardboard tubes and mounted as shown. In order to form the diagonal winding it is advisable to wind the tubes with friction tape first. —Noah J. Oak.

The most Remarkable Banjo ever built

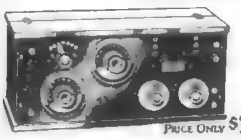
The new Gibson Mastertone, now being adopted by leading professionals like Charles McNeil of the famous Isham Jones Orchestra, pictured here, is the one banjo which combines the snap and "pep" required with big volume, exceptional carrying power, and a really musical quality of tone. Easiest to play because of Gibson's exclusive features.

Free Trial; Easy Payments!

Write today; mention instrument; mandolin-banjo; tenor-banjo; cello-banjo; guitar-banjo; mandolin; mandola; mando-cello; guitar; mando-bass.
GIBSON, INC., 2510 Parsons Street, Kalamazoo, Mich.

Gibson

STRINGED INSTRUMENTS
World's Leading Manufacturers



MIRACO GETS 'EM FROM COAST to COAST

PRICE ONLY $29.50

At rock bottom prices you get the efficiency of sets costing three times as much. Users tell us that Miraco Radio frequency receivers pick up stations from coast to coast. Operate either on dry cells or storage battery. Solid mahogany cabinets—finest workmanship throughout. Order direct or send for bulletin.

Two tube outfit.....$29.50
Four tube outfit.....$54.50

DEALERS—AGENTS—write for proposition quickly—it's a winner.
THE MIDWEST RADIO COMPANY
809 Main Street Cincinnati, Ohio

3 Free Gifts BY ACTING NOW!

NOTE—To men who investigate and act NOW I will give $25 and up extra values. Investigate TODAY!

EARN FROM $150 TO $500 a MONTH IN NEW AUTOMOTIVE ELECTRICAL BUSINESS.

New method solves instantly all Auto Electrical troubles so baffling to most repairmen. Only 1,500 out of 80,000 shops licensed by manufacturers as competent. Use this method to join the 1,500 in servicing over 13,000,000 cars. Greatest field in America to day. No canvassing—get paid for brain-work in big-pay jobs of business of your own. Clip this ad and send today for details. Say whether you can spend 50 days in Chicago, or must stay at home.

AMBU, Dept. 84, 2632 Prairie Ave., Chicago.

LATEST IMPROVED SELENIUM CELLS

A wonderful opportunity to buy first class selenium cells, at $1 each. We have decided in order to introduce our selenium products to sell 1,000 cells at this unheard price.

We have just discovered that a selenium cell will receive wireless messages with an Antenna only 2 feet long. Therefore, we presume that a selenium cell will also work with wireless telephony.

"RADIO FANS AND EXPERIMENTERS," there is a wonderful chance for you to find out more about this mysterious metal, as no doubt you will make wonderful discoveries. Size of cells are 1" x 1". Every cell guaranteed for one year (if not burned out).

Full description with hook-ups, diagrams, also a description, How to construct in less than an hour a very cheap and sensitive relay, which will work with our cells, 15c extra.

After 1,000 of these cells are sold, the price will be as formerly, $5 each again. We are the only concern in the United States that manufacture these cells, and we assure prompt delivery.

SEND Money Orders To
SELENIUM LABORATORIES
Hampton Bays, L. I., N. Y.

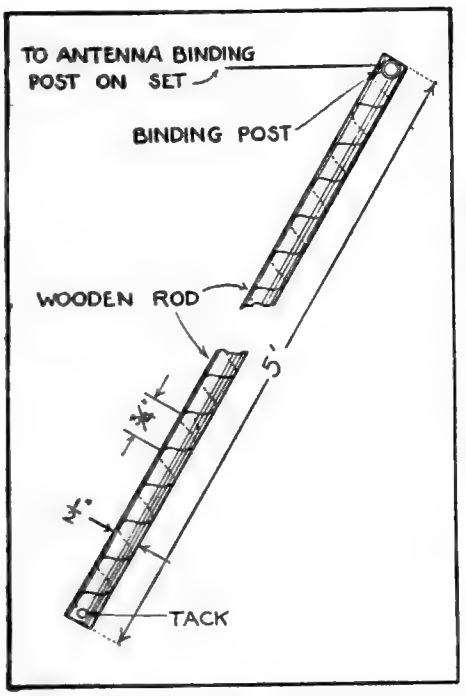
SEND NO MONEY Big 3 foot Telescope in 5 Sections

See people and objects miles away just like they were close, see Moon and Stars as you never did before. Brass bound, useful and entertaining. "Could tell color of aeroplane 4 miles away"—Mrs. Yarbrough. "Watch my boy arrive at school 2 miles away"—Mrs. Horn. "Read numbers on freight cars miles away, see mountains on moon"—A. C. Palmer. Thousands pleased.

SPECIAL OFFER. Send just your name. On arrival pay postman $1.85 plus few cents postage. Satisfaction Guaranteed or money back.
PERRY & CO., 630 Jackson Blvd., Dept. 1253 Chicago, Ill.

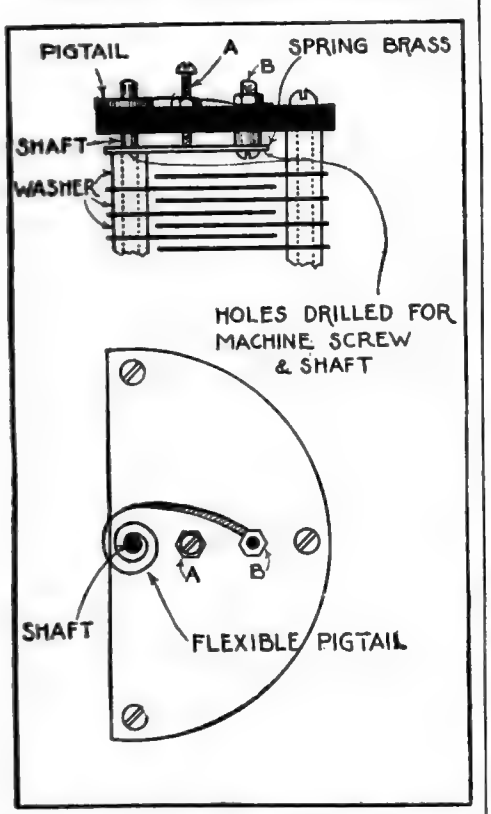
Digitized by Google Original from UNIVERSITY OF CHICAGO

INDOOR AERIAL



For receiving over short distances or for use with very sensitive sets, a very good indoor aerial may be made as illustrated above. This type of collective agency is not very directional and will give quite good results, especially when used on a set with radio frequency amplification. A one-half inch rod is wound with several turns of about No. 18 either insulated or bare wire. The turns should be spaced about three-quarters of an inch.
—Herbert I. Drew.

VARIABLE CONDENSER BEARING



Many of the variable condensers on the market today have bearings which soon become loosened through use and if contact is made through this bearing, great losses will occur. This can be eliminated usually by following the suggestion given above. A piece of heavy spring brass is mounted, as shown, by means of machine screws A and B and the other end presses against the shaft, as shown. This pressure prevents the condenser plates turning after being set. The addition of a flexible pigtail connection also makes for greater efficiency. —Robert Leinoldt.

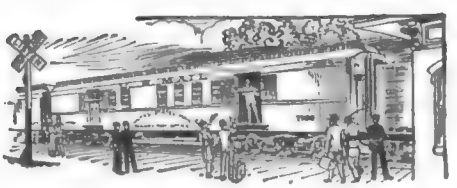
In the Dead of Night

In the dead of night a fire breaks out—the alarm must be given. A child is taken sick—the doctor must be called. A thief enters the home—the police must be located.

In the dead of night the American turns to his telephone, confident he will find it ready for the emergency. He knows that telephone exchanges are open always, the operators at their switchboards, the wires ready to vibrate with his words. He has only to lift the receiver from its hook to hear that calm, prompt "Number, please." The constant availability of his telephone gives him security, and makes his life more effective in wider horizons.

Twenty-four-hour service, which is the standard set by the Bell System, is the exception in the service of Continental Europe. An emergency may occur at any time. Continuous and reliable service has become a part of the social and economic fibre of American life.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES
BELL SYSTEM
One Policy, One System, Universal Service



WANTED
RAILWAY MAIL CLERKS
$1600 to $2300 Year

MEN—BOYS 18 OR OVER
Steady work. No layoffs. Paid Vacations.
TRAVEL—See the Country on Government Time
Common Education Sufficient
Mail Coupon today—SURE

—COUPON—
Franklin Institute, Dept. J181, Rochester, N. Y.
Sirs: Send me without charge (1) Sample Railway Mail Clerk Examination questions; (2) List of Government jobs obtainable; (3) Tell me how I can get a position.
Name .....
Address .....

Insure your copy reaching you each month. Subscribe to Science and Invention —$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Mechanical Engineering

Learn at Home!

Employers are looking for men with mechanical ability.

There is an easy, delightful way in which you can learn right at home in spare time. For 32 years the International Correspondence Schools have been giving men and women just the training they need for success in mechanical engineering and more than 300 other subjects. Hundreds of thousands have stepped into good positions through I. C. S. help.

Let the I. C. S. help *you*. Choose the work you like best in the coupon below, then mark and mail it today. This doesn't obligate you in the least, but it will bring you information that will start you on a successful career. This is your chance. Mark and mail the coupon *now*.

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6234-C, Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject *before* which I have marked an X:

BUSINESS TRAINING COURSES

☐ Business Management
☐ Industrial Management
☐ Personnel Organization
☐ Traffic Management
☐ Business Law
☐ Banking and Banking Law
☐ Accountancy (including C.P.A.)
☐ Nicholson Cost Accounting
☐ Bookkeeping
☐ Private Secretary
☐ Spanish ☐ French
☐ Salesmanship
☐ Advertising
☐ Better Letters
☐ Show Card Lettering
☐ Stenography and Typing
☐ Business English
☐ Civil Service
☐ Railway Mail Clerk
☐ Common School Subjects
☐ High School Subjects
☐ Illustrating

TECHNICAL AND INDUSTRIAL COURSES

☐ Electrical Engineering
☐ Electric Lighting
☐ Mechanical Engineer
☐ Mechanical Draftsman
☐ Machine Shop Practice
☐ Railroad Positions
☐ Gas Engine Operating
☐ Civil Engineer
☐ Surveying and Mapping
☐ Metallurgy ☐ Mining
☐ Steam Engineering ☐ Radio
☐ Architect
☐ Blue Print Reading
☐ Contractor and Builder
☐ Architectural Draftsman
☐ Concrete Builder
☐ Structural Engineer
☐ Chemistry ☐ Pharmacy
☐ Automobile Work
☐ Airplane Engines
☐ Agriculture and Poultry
☐ Mathematics

Name.....
Street Address..... 11-21-23
City..... State.....
Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

17.45 PIONEER 44 DA
EXTRA LONG BARREL
A HAND MADE

Massive "He-Man's gun of genuine Bessemer steel" with a wonderful reputation for dependability and accuracy. Beautifully finished mottled frame. **Six shots.** Similar models **retailing today at $42.50.** Specially priced at **$17.45** to clean out a limited stock on hand.

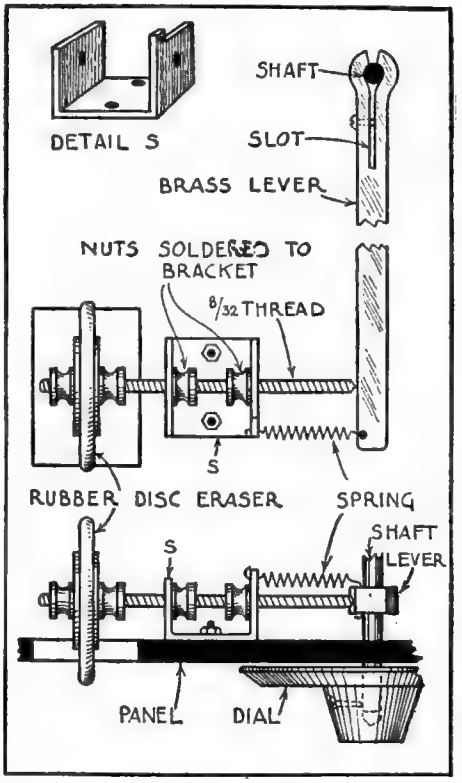
A few with fine white bone handles for those who order early. Order today!

PAY POSTMAN ON DELIVERY plus postage. **Money back promptly if not satisfied.**

PARAMOUNT TRADING CO., Dept. NIBS
34 West 28th Street New York City

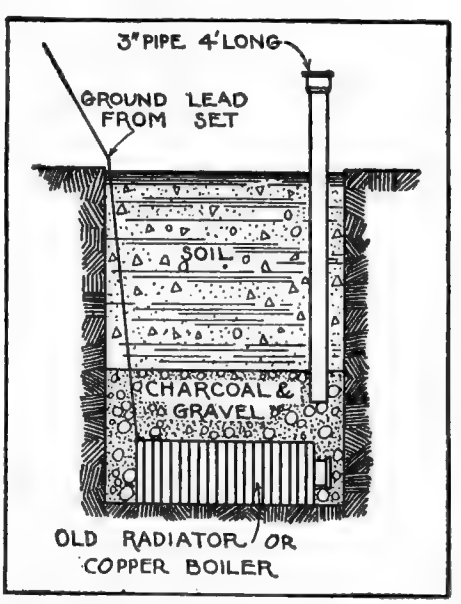
Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

CONDENSER VERNIER



An adaptation of the lever type of vernier which makes for much finer adjustment is illustrated above. The arm is made of heavy brass slotted at one end and equipped with a set screw so that it may be clamped to the shaft. This joint must not be too tight as the condenser cannot be turned by the regular knob and dial. Next, a bracket, S, is made from sheet brass and two battery nuts are soldered over the holes. This bracket is then mounted in a relative position to the lever shown in the diagram. A threaded brass rod is run through the two nuts, a rubber disc eraser fastened to one end and a spring placed as shown. Turning the knob with the thumb either one way or the other causes the arm to move and, therefore, gives a very fine adjustment to the condenser shaft. Some experimenting will have to be done in order to find the correct adjustment of the set screw. —James Gordon.

AN EFFICIENT GROUND



All too little attention is paid by the average amateur to his ground connection. In localities where it is possible to excavate a very efficient earth connection can be made as shown above. The hole is excavated to a depth of at least five feet and an old radiator or copper boiler placed in the bottom. A heavy ground lead is connected thereto and the entire metallic object covered with charcoal or a mixture of charcoal and gravel. A pipe is inserted, as shown, and the hole filled in with soil. Occasionally a pailfull of water should be poured down the pipe to keep the charcoal moist. —Wm. Henricks.

~in 90 Days

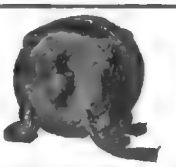
No other instrument is so easy to play as the sweet toned Saxophone. In one hour you can play the scale, in a few weeks play popular tunes and in 90 days take your place in Band or Orchestra.

BUESCHER

TRUE TONE Saxophone

is Easy to Play—Easy to Pay. Favorite instrument of most of the great artists. We give 6 days' trial in your own home. If satisfied, you can pay for it on any of our terms to suit your convenience. Same offer applies to Buescher Cornets, Trumpets, Trombones, etc. Saxophone Book sent free on request. Write for it today.

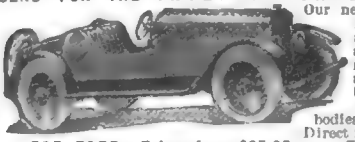
Buescher Band Instrument Co.
Everything in Band and Orchestra Instruments
6048 BUESCHER BLOCK, ELKHART, IND.



New ¼ H.P. 110 volt, guaranteed motors, 60 cycle A.C. Complete with cord, plug and pulley.
Gen. Elec. 1725 speed $14.75
Gen. Elec. ½ H.P. Rep. Ind. $39.00
Master ¾ H.P. Rep. Ind. $52.50
Master 1 H.P. Rep. Ind. $60.00
Master 1½ H.P. Rep. Ind. $68.00
One Year Guarantee
All makes and sizes up to 100 H.P. both new and rebuilt. Motors bought, repaired, exchanged. Let us quote on your needs.
Satisfaction guaranteed or money refunded.
Illustrated catalog of Motors and Supplies Free.
HYRE ELECTRIC COMPANY
631 M So. Dearborn St. Chicago, Ill.

Catch Fish, Eels, Mink, Muskrats and other animals in large numbers SURE—with our new folding, galvanized **Steel Wire Traps.** They catch them like a fly trap catches flies. Write for our FREE TRAP offer, bargain catalog of Fishermen's Supplies and booklet on best lure known for catching all kinds of fish. Agts. wtd.
WALTON SUPPLY CO., Dept. 43, **St. Louis, Mo.**

SEND FOR THE INTERNATIONAL CATALOG



Our net price list. Full line of auto bodies and accessories for Fords at Wholesale Prices. Save big money on bodies by buying Direct from Factory.
FOR FORD—Prices from $27.85 up. Factory to consumer direct—Pay only One Profit
International Body Works, 914 W. Ohio St., Dept. 4, Chicago, Ill.

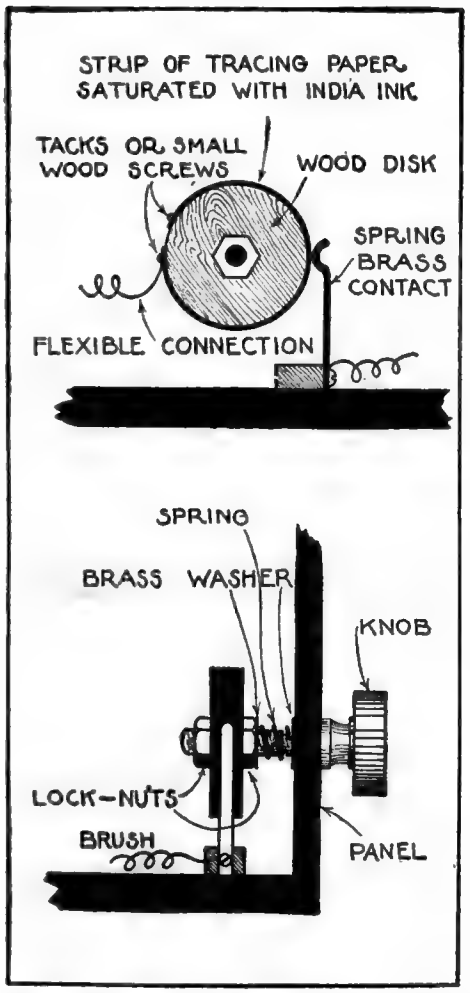
A PERFECT NOSE

Shaped at home while you sleep. Rapid, painless and safe. The ANITA is the ORIGINAL and only comfortable NOSE ADJUSTER absolutely guaranteed and highly recommended by physicians. Winner Gold Medal Feb. 1923. Write for FREE booklet. **The ANITA CO., Dept. 573, Anita Bldg., Newark, N.J.**

BEFORE AFTER

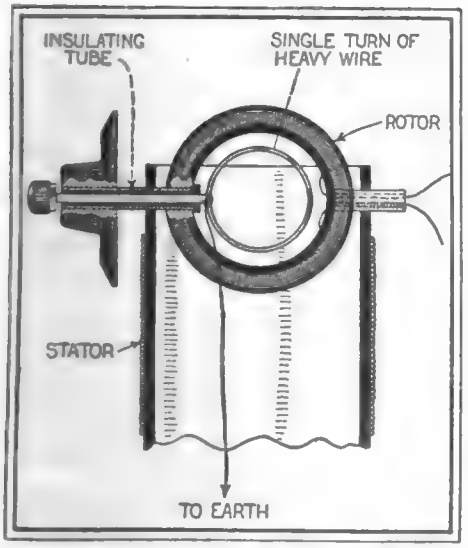
Digitized by Google Original from UNIVERSITY OF CHICAGO

ROTARY GRID LEAK



A simple yet efficient rotary variable grid leak can be readily made by following the diagram given above. The rotating drum can be made from a wooden checker upon which is tacked a strip of tracing cloth which has been saturated with India ink and allowed to dry. The ends of the strip are not allowed to touch and a connection is made to one of these ends by means of a piece of flexible wire. The other contact is made by a strip of spring brass mounted as shown. —Leroy Western, Reporter No. 15.

SHADING COIL



Another vario-coupler kink which very often aids considerably in sharp tuning is shown above. Here a single short circuited turn of heavy copper wire, either bare or insulated is mounted within the rotor of a vario-coupler and so arranged that it can be turned independently of the rotor. A standard vernier dial, of the type with an extra knob is employed as shown. The rotor may be controlled by means of the dial and after a station is tuned in fairly well, a small rotation one way or the other of the short circuited turn will be found to help considerably. —Harry Ackerson.

He took the world to her

Twenty-five years ago a boy left a little country town to find his fortune. He found it.

Two years ago, when radio was still a novelty, he took a receiving set back to the old home and set it up in his mother's room. That evening the world spoke to her.

She could not follow her boy away from home. But the best that the world has to give —in music, in lectures, in sermons—he took back to her.

The modern vacuum tube, used in radio transmission and reception and in so many other fields, is a product of the Research Laboratories of the General Electric Company. These Laboratories are constantly working to develop and broaden the service of radio.

GENERAL ELECTRIC

"THERE'S MONEY IN IT"

AT HOME LEARN TELEGRAPHY AT HOME

MORSE AND WIRELESS

TEACH YOURSELF in half usual time, at trifling cost, with the wonderful Automatic Transmitter THE OMNIGRAPH. Sends unlimited Morse or Continental messages, at any speed, just as an expert operator would. Adopted by U. S. Government and leading Universities, Colleges and Telegraph Schools. 3 styles. Catalog free.

If you own a Radio Phone Set and don't know the Code, you are missing most of the fun.

OMNIGRAPH MFG. CO. 22 Hudson St., NEW YORK

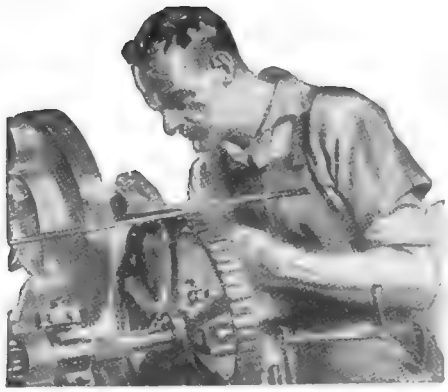
Wonderful, new device, guides your hand; corrects your writing in few days. Big improvement in three hours. No failures. Complete outline FREE. Write C. J. Ozment, Dept. 44 St. Louis, Mo.

STAMMER NO MORE

Kill the *fear* of stammering. Re-education the key. The widely famed Hatfield Method fully outlined in an accurate, dependable, worthwhile book—"HOW TO STOP STAMMERING." It has inspired thousands. Free copy today.

THE HATFIELD INSTITUTE, 189 W. Dearborn, Chicago, Ill.

Digitized by Google Original from UNIVERSITY OF CHICAGO



He's Patented Four Inventions

AND he's only one of scores of inventors who got their first real start through spare-time study with the International Correspondence Schools.

Jesse G. Vincent, Vice President of the Packard Motor Car Company, inventor of the Packard Twin Six and co-inventor of the Liberty Motor, is a former I. C. S. student.

So is John C. Wahl, inventor of the Wahl Adding Machine and the Eversharp Pencil; W. E. Hallett, inventor of the Hallett Tandem Gas Engine; H. E. Doerr, Chief Mechanical Engineer, Scullin Steel Company, and W. J. Libby, inventor of the Libby Mine Hoist Controller.

HERE'S the same coupon—the same opportunity that these men had. There's still a chance for you to get ahead if you will only make the start.

One hour after supper each night, spent with the International Correspondence Schools in the quiet of your own home, will prepare you for the position you want in the work you like best.

Yes, it will! Put it up to us to prove it. Without cost or obligation, just mark and mail this coupon.

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6235-C, Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject *before* which I have marked an X:

BUSINESS TRAINING COURSES

☐ Business Management
☐ Industrial Management
☐ Personnel Organization
☐ Traffic Management
☐ Business Law
☐ Banking and Banking Law
☐ Accountancy (including C.P.A.)
☐ Nicholson Cost Accounting
☐ Bookkeeping
☐ Private Secretary
☐ Spanish ☐ French
☐ Salesmanship
☐ Advertising
☐ Better Letters
☐ Show Card Lettering
☐ Stenography and Typing
☐ Business English
☐ Civil Service
☐ Railway Mail Clerk
☐ Common School Subjects
☐ High School Subjects
☐ Illustrating

TECHNICAL AND INDUSTRIAL COURSES

☐ Electrical Engineering
☐ Electric Lighting
☐ Mechanical Engineer
☐ Mechanical Draftsman
☐ Machine Shop Practice
☐ Railroad Positions
☐ Gas Engine Operating
☐ Civil Engineer
☐ Surveying and Mapping
☐ Metallurgy ☐ Mining
☐ Steam Engineering ☐ Radio
☐ Architect
☐ Blue Print Reading
☐ Contractor and Builder
☐ Architectural Draftsman
☐ Concrete Builder
☐ Structural Engineer
☐ Chemistry ☐ Pharmacy
☐ Automobile Work
☐ Airplane Engines
☐ Agriculture and Poultry
☐ Mathematics

Name.....
Street Address..... 11-21-23
City..... State.....
Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

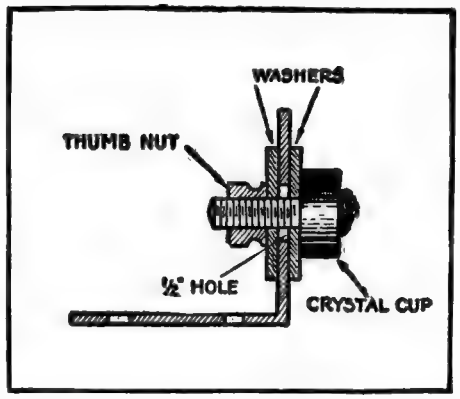
Electrical Engineering In One Year

men with training are in demand. For more than thirty years, this school has been training men of ambition and limited time, for the electrical industries. Condensed course in Electrical Engineering enables graduates to secure good positions and promotions. Theoretical and Practical Electricity, Mathematics, Steam and Gas Engines and Mechanical Drawing. Students construct motors, install wiring and test electrical machinery. Course with diploma complete

Over 4,000 men trained. Thoroughly equipped fireproof dormitories, dining hall, laboratories, shops.
Free catalog. 32nd year begins Sept. 24, 1924
BLISS ELECTRICAL SCHOOL
106 TAKOMA AVE., WASHINGTON, D.C.

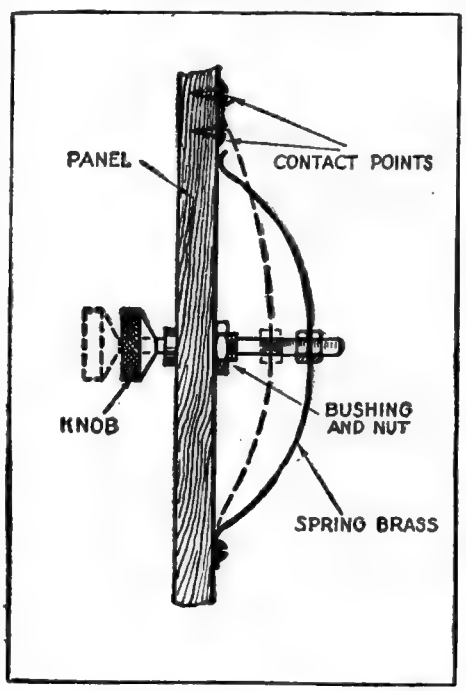
Print Your Own
Cards, circulars, labels book, paper. Press $12. Larger $35 Job press $150. Save money. Print for others, big profit. All easy, rules sent. Write factory for press catalog, TYPE, cards, etc. THE PRESS CO., D-47 Meriden, Conn.

IMPROVED CRYSTAL MOUNTING



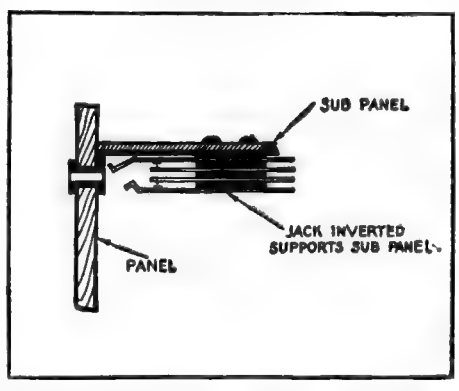
By mounting a crystal as shown above, the cup may be moved over quite a space by loosening the thumb nut and tightening when the correct adjustment is arrived at. —Leroy Western, Reporter No. 15.

PUSH-PULL SWITCH



A very neat switch for use on a radio panel can be constructed from odd parts as shown above. A strip of spring brass is used and actuated by a short brass rod. Two contact points are placed for the end of the brass strip to rest on. The adjustment of the tension and the curvature of the end of the brass strip should be experimented with so as to obtain the correct results. —Royal W. Knox.

SUB-PANEL SUPPORT



In radio sets where sub-panels and jacks are to be used, the former may be supported by the latter by inverting the jack and fastening the sub-panel to it as shown above. Space is saved and the necessity of extra brackets is done away with. This arrangement does not interefere with the working of the jack in any way. —Francis N. Gilreath.

Make Money Taking PICTURES

Tremendous, big-paying opportunities are open for ambitious men in Modern Photography. This is the picture age. Magazine and newspaper publishers buy thousands of photographs each year. Every manufacturer sends out high priced pictures of his products. Every home wants portraits. Photography is a business running into millions of dollars each year. And there is a great shortage of trained photographers.

Got $100 for Flood Pictures
"I took pictures of a flood and sold them for $100. I have been able to buy my house and lot from the sale of pictures."
C. M. Cole, Washington.

$97 in 2 Days!
"I made $285 in December. Went out two days last week on home portrait work and made $97."
A. G. Hughes, Kentucky.

Earn $3,000 to $10,000 a Year

Hundreds of men are earning big money and establishing their own businesses. Even during spare time, while training, you can make $75 a week easily—no matter where you live!

Amazing New Easy Method

I show you at home, how to do the kind of work turned out by the big studios in New York and Chicago! I show you how to make big money within 30 days! C. M. Cole bought a home with money he had made when only half way through his training. So well do I know what I can do for you that I guarantee under bond to return every cent of your tuition if you are not thoroughly satisfied.

Professional View Camera FREE!

Write at once for Free Camera Offer—I give you, free, a splendid professional view camera. You will be astonished and delighted. This offer open for short time only—so act quick! No obligation.

INTERNATIONAL STUDIOS, Inc.
Dept. 7455
3601 Michigan Ave., Chicago, U.S.A.

The DREADNAUGHT

famous side-swing hand ejector revolver 32, 38 and 32-20 calibre guaranteed imported from Spain. Reg. $25 value. **$11.95**

The Super Dreadnaught Imported from Spain. Made of fine tool steel 32, 38 and 32-20 calibre Reg. $35 value. **$14.50**

World famous German Luger, 30 cal. **$15.45.** Imported Top Break Revolver, automatic ejecting 32, or 38 cal. **$7.85.** Genuine **Mauser**, 9 shots automatic 25 cal. **$11.50.** 32 cal. **$12.50.** All brand new and absolutely perfect. Guaranteed imported. Use Standard Cartridges.
Pay on arrival plus few cents postage. Satisfaction or money refunded. **SEND NO MONEY**
UNITED SALES CO., 16 E. 22nd Street Dept. 312 New York

Branston Int. R. F. Transformer

BRANSTON KIT NO. R99
Oscillator Coupler, 3 Intermediate Radio Frequency Transformers, Special Transfer Coupler, Special Antenna Coupler, $36.50. All carry Branston guarantee. Ideal for Super-Heterodyne, Ultradyne and similar circuits. Our booklet, "Super-Heterodyne Construction" ($1.00) makes it possible to construct a complete and efficient Super-Heterodyne Receiver.
At your dealer's or write us
CHAS. A. BRANSTON, Inc. 816 Main St., Buffalo, N. Y.
In Canada—Chas. A. Branston, Ltd., Toronto, Ont.

Build This Real Auto!

A sturdy, dependable motor car. Any handy man or boy can build it. Power supplied by famous 2½ H. P. SHAW Motor.

Send for illustrated Circulars, 2 cts. postpaid. Complete Illustrated Book of Building Plans 25c postpaid. Write today.
SHAW MFG. CO.
Dept. 12
Galesburg, Kas.

BOOK OF PLANS 25¢

Straightens Shoulders —Increases Pep

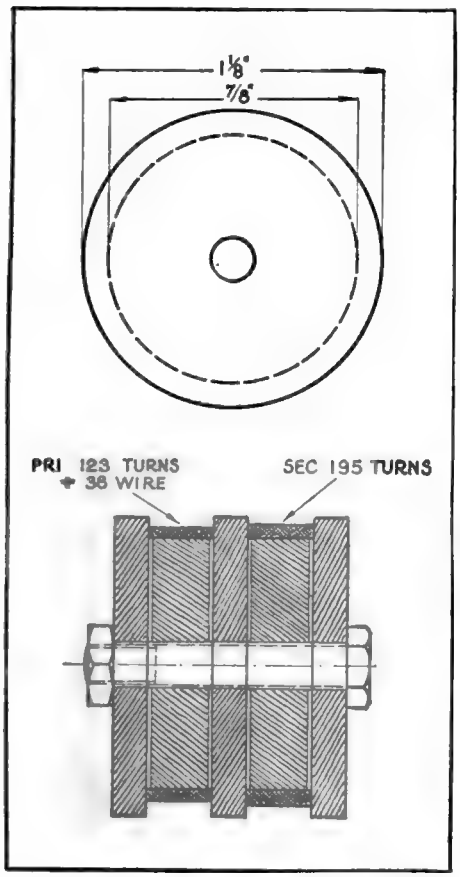
THE NATURAL BODY BRACE—Corrects stooping shoulders, straightens the back, gives the lungs chance for normal expansion, induces proper breathing. Brings restful relief, comfort, energy, and pep. For men and women.

Costs nothing to try it
Write for 30 days free trial offer and free book.
NATURAL BODY BRACE CO.
Howard C. Rash, Pres. 286 Rash Bldg., Salina, Kansas

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

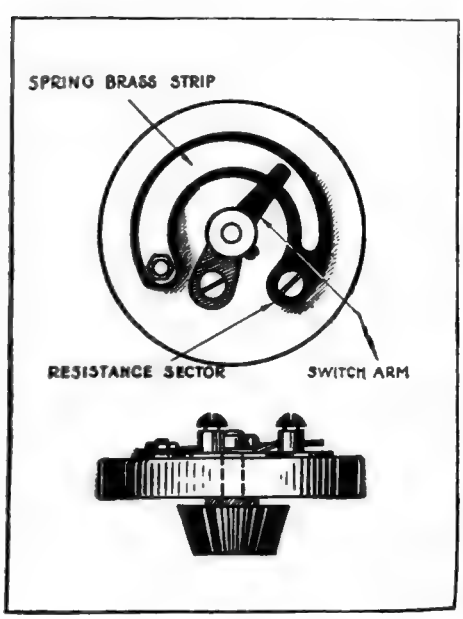
Digitized by Google
Original from UNIVERSITY OF CHICAGO

RADIO FREQUENCY TRANSFORMER



A fairly efficient radio frequency amplifying transformer can be constructed by following the data given in the illustration above. Five disks of wood are cut, three of them 1⅛ inches in diameter and two of them ⅞ of an inch in diameter. They are then assembled, as shown in the lower part of the above illustration, and held together with a machine screw. In one slot is wound 123 turns of No. 38 enameled wire and in the other 195 turns of the same size wire. This transformer is connected in the usual manner. —Robert Clark.

VARIABLE GRID LEAK



An old rheostat base makes a good mounting for the above illustrated grid leak. First soak a curved section of cloth in India ink and mount on the base. Then cut out a piece of thin strip brass, fastening one end, as shown, and bending the other. Then by rotating the switch arm over the brass strip, the latter will be made to touch the resistance sector and thereby vary the resistance. —J. F. Bosmik.

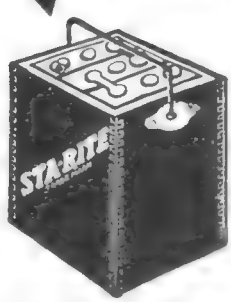
"What a whale of a difference just a few cents make!"
— all the difference
between just an ordinary cigarette and—FATIMA, the most skillful blend in cigarette history.

STA-RITE RADIO BATTERIES SAVE YOU 60%

And Guarantee You In Writing 2 Years of Better Battery Performance

STA-RITE RADIO BATTERIES are made especially for Radio and the big saving is made possible by coming direct to you instead of thru distributors dealers etc. Boxes are made of oak finished in mahogany and the plates very thick and will give a steady discharge over a long period. No premiums, just good honest battery value.

TRY TO BEAT THESE PRICES



2 Volt for W.D. 11 and 12	$4.00	6 Volt 60 Amphr.	$ 7.50
4 Volt for U.V. 199 Tubes	7.00	6 Volt 80 "	8.50
		6 Volt 100 "	10.00
		6 Volt 120 "	12.10
RADIO B. STORAGE Glass Jars, Heavy Plates— Case of 12 Cells 24 V.	4.90	6 Volt 150 "	14.00
		6 Volt 200 "	17.00

Get Yours Today—NOW—Send No Money

The batteries are fully guaranteed in writing and shipped subject to examination on the day your order is received. You pay on delivery or deduct 5 per cent if full cash accompanies order. You may deduct 10 per cent if two or more are ordered at one time

STA-RITE BATTERY CO. Dept. 11 LOUISVILLE, KY.

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

$100 a Week
in this Fascinating Business

EARN big money as a cartoonist! Millions of dollars were spent last year on comic strips, political and sport cartoons, animated cartoons, etc. Thousands of new cartoonists are needed now to meet the ever-increasing demand for this work. Never before have the opportunities in this fast-growing field been so many, so varied or so high-paying.

Easy to Learn CARTOONING at Home in Spare Time

Regardless of how little you know about cartooning now, you can easily qualify for a position in this attractive, high-salaried business. This home-study method starts you at the simplest fundamental principles of cartoon-making and takes you through every branch of humorous and serious cartooning. You will be amazed at how quickly it teaches you to draw salable work. Many students of this method began to sell their drawings before they were half through their courses. The training paid for itself long before they finished it. Learn cartooning this easy way. Enjoy the fascinating life of a successful cartoonist—easy hours, freedom from routine, your own boss, and $3,000 to $15,000 a year for this work that is play!

Send for FREE BOOK

Learn more about the wonderful opportunities in Cartooning, and details about this remarkable home-study method. A handsomely illustrated booklet has just been prepared which, upon request, will be sent to you without the slightest obligation. This booklet gives a thorough outline of the cartooning field, and explains in detail this wonderful new method of teaching Cartooning. Send for it today!

WASHINGTON SCHOOL OF CARTOONING
Room 265, 1113-15th St. N. W., Washington, D. C.

WASHINGTON SCHOOL OF CARTOONING,
Room 265, 1113 15th St. N. W., Washington, D. C.

Please send me, without obligation, your Free Booklet on Cartooning and full details of your home-study method of teaching Cartooning.

Name .....
(Print Name Plainly.)

Address .....

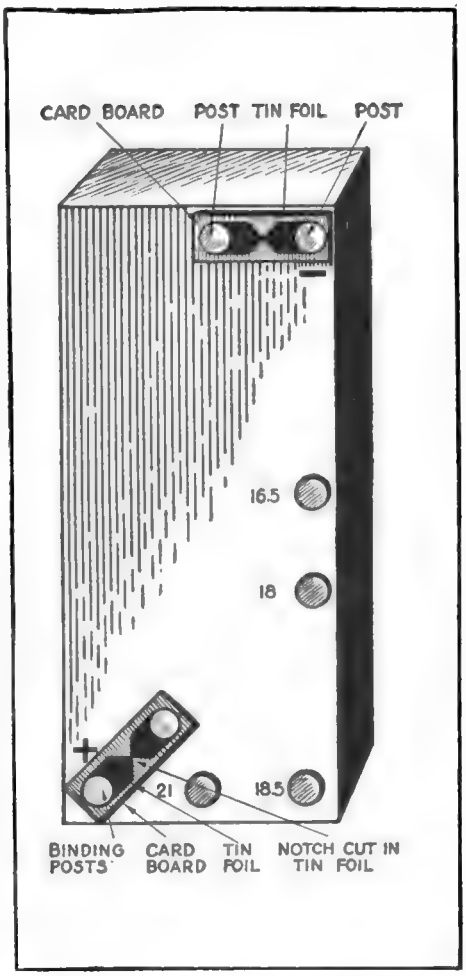
City .....State .....
(If under 16, please give age.....)

Begin Today—Write for My FREE BOOK. I can make a good penman of you at home during spare time. Write for my FREE BOOK, "How To Become a Good Penman." It contains specimens and tells how others mastered penmanship by the Tamblyn System. Your name will be elegantly written on a card if you enclose stamp to pay postage. Write today for book.
F. W. TAMBLYN, 424 Ridge Bldg., Kansas City, U.S.A.

You can be quickly cured, if you
STAMMER
Send 10 cents for 288-page book on Stammering and Stuttering, "Its Cause and Cure." It tells how I cured myself after stammering 20 yrs. B. N. Bogue, 8104 Bogue Bldg., 1147 N. Ill. St., Indianapolis

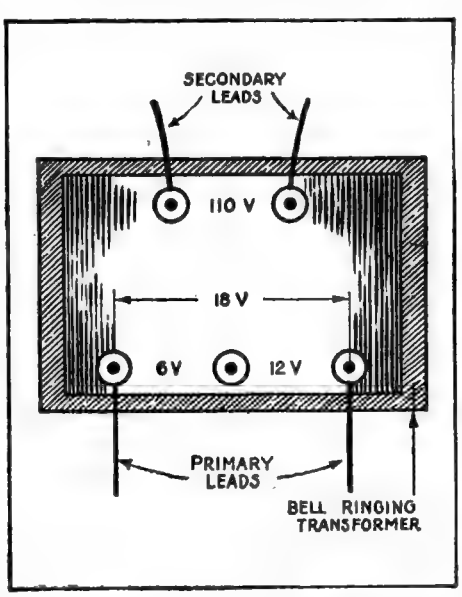
Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

BATTERY FUSE



A fuse for the protection of tubes may be placed on the "B" battery in the manner illustrated above. Melt spots in the wax on top of the battery and insert binding posts therein. Fasten the posts solid with molten wax. Then place on the battery strips of cardboard covered with strips of tinfoil, as shown., first cutting notches in the tinfoil. The thin metal strip acts as a fuse in case of a short circuit. —Robert Lawrence.

MAKE-SHIFT TRANSFORMER



The average electrical and radio experimenter usually has at his command one or more bell ringing transformers. These can be impressed into service as audio frequency amplifying transformers by connecting them up in the standard manner, making the connections to the binding posts, as shown above. If an 18-volt transformer is available, take one primary lead from the 18-volt post and the other from the common post.—G. William Dayton.

Let Sousa tell You Music Success Secrets FREE

Conn instruments speed your progress—insure success. Used and endorsed by world's great artists. Exclusive features, including the famous hydraulic expansion of tubing, make Conns—easiest to play—beautiful in tone—perfect in scale—reliable in action—slide, valve or key—artistic design and finish.

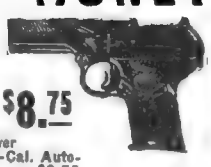
Free Trial; Easy Payments. Send for your copy of "Success in Music" by Sousa and other famous musicians, and details of trial offer. All exclusive Conn features are yours at no greater cost.

C. G. CONN, Ltd.
556 Conn Bldg. Elkhart, Ind.

CONN BAND INSTRUMENTS

SEND NO MONEY

SUPER 32 POLICE AUTOMATIC



15-shot super automatic like those used by German military officers. Extra magazine free. Never before this was any 15-shot, 32-Cal. Automatic offered at this price..... $8.75
World's Famous Luger, 30 Cal.... 21.00
Top Break Revolver, 32 or 38 Cal., Special at.. 7.95

$8.75

$6.65

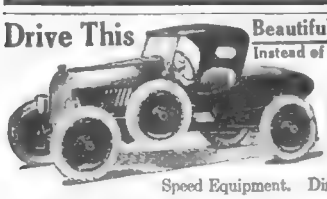
SATISFACTION GUARANTEED
Send No Money. Pay Postman Our Price, Plus Postage.
All Brand-New Guns. Use Standard Ammunition.

POCKET AUTOMATIC
For dependable construction and smoothness of action this 7-shot, 25-cal. automatic cannot be beat $6.75

WATTS TRADING CO.
11 Warren St., Dept. 654 NEW YORK CITY

Be An Auto Expert
Learn the Simplex Way!
Let us prepare you at home to become an auto Expert.
Write for SPECIAL OFFER
SIMPLEX AUTO SCHOOL
2016-2024 W. Van Buren St.
Chicago, Ill.

Drive This Beautiful Raceabout Instead of Your OLD FORD



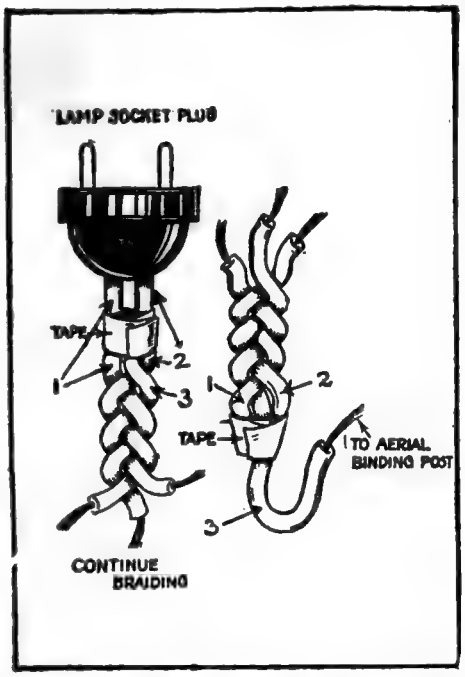
Choice of Four Colors; Flat or the Bullet Nose Radiator Shell. Send for 1924 Free Catalog of New Auto Acces', Bodies and Speed Equipment. Direct from Factory.
AMERICAN TOP AND BODY CO., Ohio Street, DELPHI, IND.

30 Days' Free Trial

Select from 44 Styles, colors and sizes, famous Ranger bicycles. Delivered free on approval, express prepaid, at Factory Prices, from $21.50 up.
$5 a Month if desired. Parents often help. Boys can earn small payments.
Tires wheels, lamps, horns, equipment at half usual prices. Send No Money. Write for our marvelous prices and terms.
Mead CYCLE COMPANY Dept. B-107 CHICAGO Write us today for free catalog

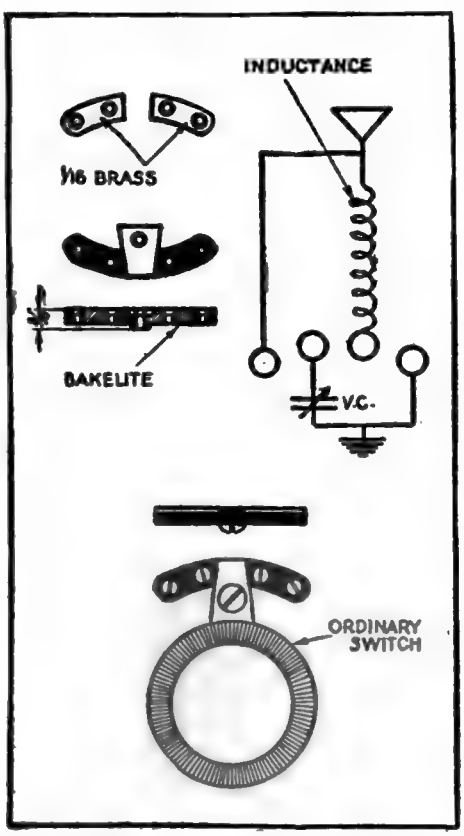
Digitized by Google
Original from UNIVERSITY OF CHICAGO

LAMP SOCKET AERIAL



The ever present antenna problem of the apartment house dweller can be easily and cheaply solved in the manner shown above. Secure an ordinary light plug and three pieces of flexible lamp cord, one piece long enough to reach from the nearest electric light socket to the set and the other two pieces about 5 feet long. Braid them together as shown above, the two short pieces connecting to the prongs of the plug. The third piece does not make any connection whatsoever except to the set. Insert the plug in a socket and it is ready to use.—E. A. Lenz.

SERIES PARALLEL SWITCH



A variation of the series parallel switch which gives greater flexibility may be made as shown above. Two strips of brass are mounted on a bakelite strip, as shown, and the latter mounted on an ordinary switch arm. Four switch points are then mounted on the panel and connected as illustrated. By means of this switch the variable condenser can be placed in parallel or in series with the inductance or the latter can be connected directly to the ground without any external capacity in the circuit.

—Harold B. White.

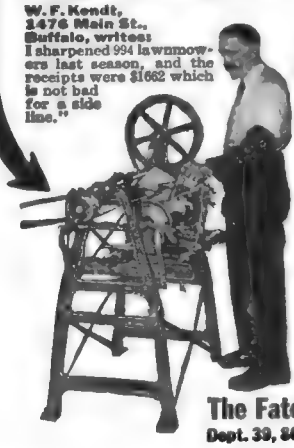
$1662.00 Earned IN ONE SEASON

A New Business—Big Business

A Business to Enthuse Over—
The "Ideal" Lawn Mower Sharpener

A wonderful invention that sharpens lawn mowers scientifically—quickly—perfectly; does the work as nothing else can.

W. F. Kendt, 1476 Main St., Buffalo, writes: I sharpened 994 lawnmowers last season, and the receipts were $1662 which is not bad for a side line."



Fred C. Milkert of Melrose Park, Ill., writes: "The Ideal Lawnmower Grinder put me in business, starting in the basement of my home and forcing me now for the third time to move into bigger quarters. Today the dream of my life—a shop of my own—is realized. With a machine like yours and a little hustle any man can have a business of his own and be independent."

You Start Now No town too small. Lawn mowers are dull—owner doesn't know where to get them sharpened. Mowing the lawn dreaded because of dull or improperly sharpened mower. Lawn mowing healthful, invigorating and pleasant when Mower is "Ideally" sharpened. You do the work scientifically—you are in big demand.

Lawn Mowers Sharpened to Razor Edge— People glad—owners delight in mowing lawn with mower sharpened on an "Ideal." Mower runs light—click-click-click and the grass is cut. Build a permanent business for yourself. Start now!

Write Today Get our proposition FREE—We have detailed illustrated book to send you. Write today for proposition.

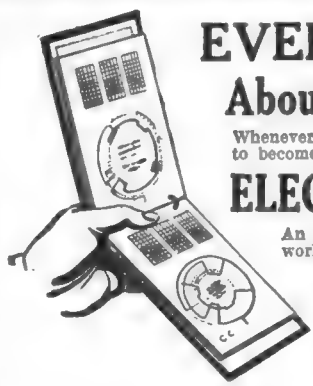
The Fate-Root-Heath Co.
Dept. 39, 803 Bell St., Plymouth, O.

USE THIS—Mail It TODAY

The Fate-Root-Heath Co.
803 Bell St., Dept. 39, Plymouth, Ohio
Please mail at once details of your complete proposition.

Name _____

Address _____



EVERYTHING You want to know About A. C. Motors and Repairing

Whenever any question arises regarding motors, or if you are anxious to become a specialist on electrical motor work, you need the

ELECTRICAL WORKERS FRIEND

An invaluable collection of diagrams and instructions for electrical workers, students, amateurs, etc.

This book contains 66 motor diagrams with complete instructions for rewinding and reconnecting A. C. Motors. Shows how to put each coil in the slots, giving all internal and external connections. For reconnecting they cover all practical changes showing which diagram to use for the change wanted. Bound in loose leaf form for handy reference. The only complete book of its kind on the market. So simple anyone can understand. It is helping thousands of other workers—it will help you too, as hundreds of testimonials prove.

SPECIAL PRICE, COMPLETE $3.00 Order today. If desired we will ship C. O. D. by Parcel Post, U. S. only.

YOU CAN EARN YOUR COPY FREE

We offer all owners of the Electrical Workers Friend a commission of 50c on every book they help us sell. All you have to do is show your book and recommend it. You can earn the full price of one of these books in a few days. Write immediately for full particulars—this offer is limited.

SMITH & SMITH PUB. CO. 7428 Hermitage Street, Dept. B, Pittsburgh, Pa.

BUY RADIO NEWS BUY

RADIO'S GREATEST MAGAZINE

The Big Radio Magazine for Everybody

25c the Copy on all Newsstands or $2.50 per Year

EXPERIMENTER PUB. CO., Inc., 53 Park Pl., New York

Insure your copy reaching you each month. Subscribe to Science and Invention —$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Digitized by Google

Original from UNIVERSITY OF CHICAGO

YOUR NAME STAMPED FREE

BOTH
Inkograph
and
Leadograph
at Combination Price of $2.00

Here's an opportunity for those seeking the joy of a perfect writing instrument. Secure both a pen and pencil with your own name on each for less than the usual price of a real fountain pen alone. We are making this unusual offer because we want 5000 new Inkograph and Leadograph users this month. We know it pays to invest in new friends. Satisfied users make our best advertisement. Experience taught us that every pen sold makes new friends. There are over half a million now in use. Act quickly, for we reserve the right to withdraw this offer at any time.

INKOGRAPH IMPROVES WRITING 100 PER CENT.
Because of the ease that the ink flows, your writing will be improved 100 pc. It cannot leak. Eliminate danger of soiling hands or clothing. The automatic feed works freely up and down within writing point.

14 KT. WHITE GOLD POINT AND FEED
A very beautifully polished pen of best grade hard rubber, has permanent nickeled pocket clip giving it an appearance which compares with pens sold at double the price.

LEADOGRAPH SUPERIORITY
Rich in appearance, handsomely chased and highly polished, same as any high grade fountain pen. It is light in weight, will not cause writer's cramp and writes smoothly at all times. Works both ways (propels and repels). Easily refilled with new Eversharp or any other standard make leads.

GUARANTEE
certificate and full directions with each order.

HOW TO ORDER
Print your name and address clearly on coupon below and enclose a two dollar bill. Your Inkograph and Leadograph with your name stamped on each will be sent by return prepaid mail. Or if you prefer, we will ship C.O.D. for $2.25

Agents Wanted

Inkograph Co., Inc.
Dept. 125 670 Sixth Ave., N.Y.

I accept your combination offer for the Inkograph and Leadograph with my name stamped free. Enclosed you will find $2. in full payment. If you prefer C. O. D. shipment and want to pay the postman $2.25 on arrival put "X" here ☐

Name _____

Address _____

City _____ State _____

Watch the Roof-tops!

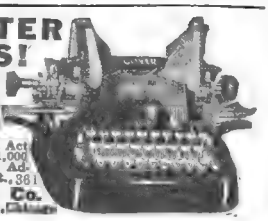
TRANSCONTINENTAL
RIBBON (Trade-Mark) COPPER AERIAL

For better tone, bigger volume, greater distance with any tube or crystal set use Transcontinental RIBBON Aerials. Nearly a million "on the roofs" everywhere. Order by mail C.O.D. (plus postage)

50 Ft. $1.50
75 Ft. $2.25
100 Ft. $3.00
150 Ft. $4.50

A.V. ANTHONY & CO.
Dept. 107, Maywood, Ill.

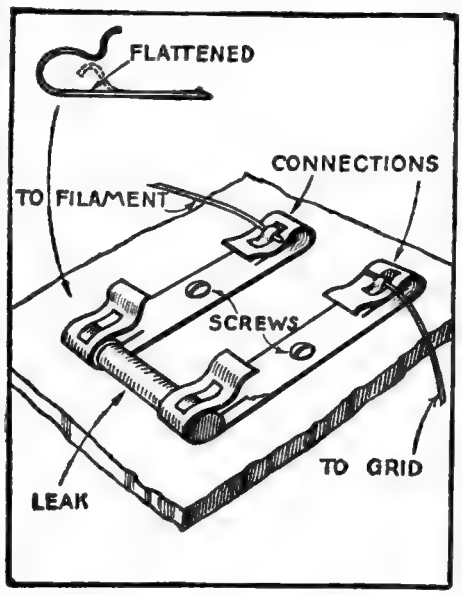
TYPEWRITER BARGAINS!



A real writing machine, standard keyboard, all improvements, rebuilt like new in Oliver's own factory for a fraction of what you expect to pay! Easy terms. Send now for new offer. Act quick, and get yours from 1,000 machines just put through! Address—Rebuilt Machine Dept., 361

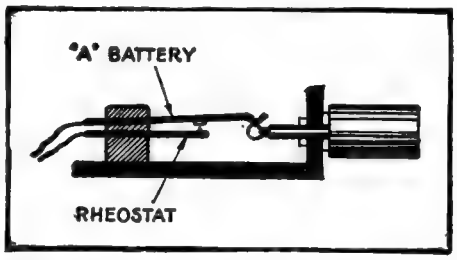
Oliver Typewriter Co.
365 Oliver Typewriter Bldg., Chicago

GRID LEAK HOLDER



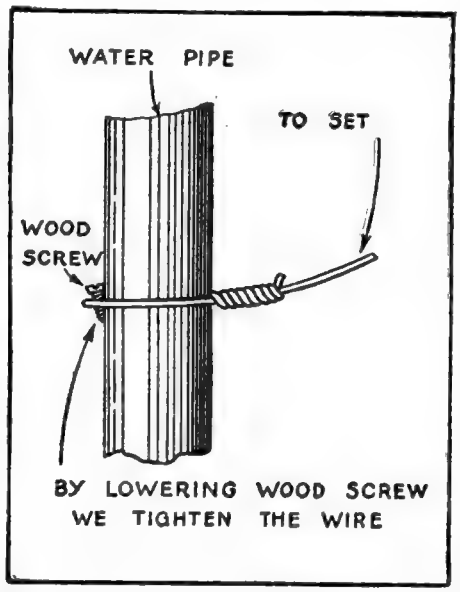
By flattening out the little brass hook on one end of two double connectors as shown above, a clip for holding tubular grid leaks can be quickly made. Connections may be readily made to the other end of the clips.
—Howard Fettes.

BATTERY SWITCH

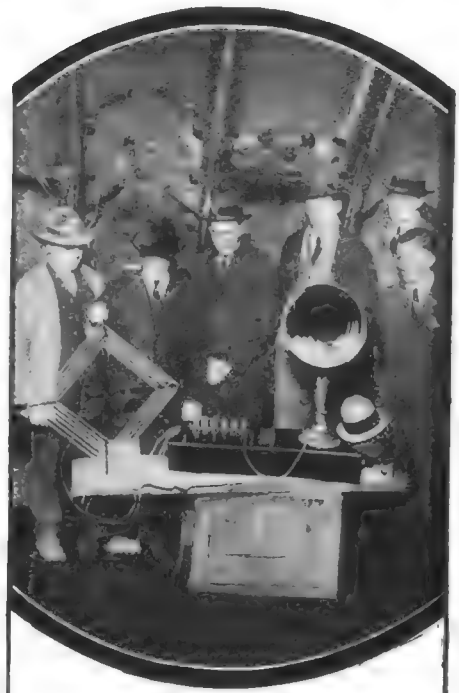


A simple switch for controlling the "A" battery can be made by connecting a jack in the circuit, as shown above. Inserting a plug opens the circuit and withdrawing it closes the circuit.
—F. J. Cartledge, Jr.

GROUND CONNECTION



When a ground connection is to be made in a hurry and no ground clamp is available, a substitute may be made as shown above. Simply wind a wire around the pipe, after cleaning the latter thoroughly, and insert the point of a wood screw as shown. By turning the latter in a clockwise direction it will lower itself and hence tighten the wire.
—A. Segoll.



RADIO

is a permanent feature of

Science and Invention
IN PICTURES

Over 25 non-technical, live, current Radio features are included in each issue of *Science and Invention.*

Science and Invention offers $12,000 in prizes in every issue. The contests are open to all.

Science and Invention has 9822 reporters combing the World for interesting, new things in the wide, fascinating field of Science.

—And *Science and Invention* tells everything in clear, interesting pictures and short captions.

On All Newsstands, 25c the Copy
Subscriptions:
One Year, $2.50
Canadian and Foreign, $3.00
Two Years, $4.25
Canadian and Foreign, $5.25

Experimenter Publishing Co., Inc.
Publishers of
Science & Invention, Radio News, Practical Electrics and Motor Camper & Tourist
53 PARK PLACE
NEW YORK CITY, N. Y.

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C

Digitized by Google
Original from UNIVERSITY OF CHICAGO

AGENTS 500% PROFIT

Genuine Gold Leaf Letters

GUARANTEED TO NEVER TARNISH

GOLD & SILVER S SIGN LETTERS

For store fronts, office windows, Bank windows, Office Doors, Panels, Board Signs, Trucks, Automobiles and Glass Signs of all kinds. Anyone can put them on and make money right from the start without previous experience. All you have to do is to show your samples: the letters are very attractive and easy to sell. Letters costing 4c sell for 25c. One agent says: "Your Letters are the best thing I have seen in years: I have made $125.00 the first week and still going strong." Paul Clark says: "Smallest day $28.70." H. Gilder made $835.00 in six weeks.

$60 TO $200 A WEEK

GENERAL AGENTS—It is easy to appoint sub-agents for this line. We pay you 20% cash commission on all orders we receive from local agents appointed by you anywhere. We allow you 50% discount on your own orders. You can sell to nearby trade or travel all over the country, as you please. Large demand for window lettering everywhere. Write today for free sample, full particulars and liberal offer to general agents.

METALLIC LETTER CO.

415 N. CLARK ST. CHICAGO

YOU TOO CAN PLAY THE **HAWAIIAN GUITAR**

JUST AS THE HAWAIIANS DO!

PLAY ALL THE LATEST HITS

After Your FIRST LESSON You Will Play a Complete Selection. We Guarantee That--

Our method is so simple, interesting and appealing that you begin in your first lesson to learn the famous Hawaiian Folk Song "ALOHA". Think how happy you will be when you surprise your friends by playing the fascinating Hawaiian Guitar.

Only Four Motions--and You Master Them Quickly!

In a few minutes you acquire the four motions necessary to play any piece—after that a short period of practice and you will have mastered this weirdly sweet music. Complete course of 52 lessons includes FREE beautiful Hawaiian Guitar, necessary picks, steel bar, etc. No extras.

No Previous Musical Knowledge Necessary

If you *never read a musical note in your life*—if you haven't even the slightest knowledge of music, we can quickly and positively teach you to play this wonderfully popular instrument. Don't be just a "listener" when you can *easily be the center of interest* among your friends. Over 40,000 successful students.

Just Mail a Post Card for Details

of our remarkable FREE Hawaiian Guitar Offer—simply write: "I am interested"—*but do it today!*

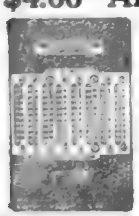
First Hawaiian Conservatory of Music, Inc.

Special courses on Ukulele, Tenor-Banjo, Banjo-Ukulele and Cavalele.

Desk 49—233 B'dway (Woolworth Bldg.) New York City

FREE A Beautiful Hawaiian Guitar

$4.00 ADDING MACHINE



The GILSON ADDER will do your figuring easily, quickly and with absolute accuracy. It adds, subtracts, multiplies and divides and automatically carries from one column to the next. Capacity 109,999,999 or $1,099,999.99. Size 3½"x6"x1¼". Made with aluminum case and steel operating parts. Written Two-Year Guarantee. Catalogue free.

Price, postpaid, $4.00

your money back if you are not satisfied.

GILSON SLIDE RULE CO., NILES, MICH.

"LIGHTING FIXTURES"

READY TO HANG

Direct from manufacturer.

Completely wired including glassware.

Send for Catalogue No. 26 (Just off the Press)

Special Proposition to Dealers

ERIE FIXTURE SUPPLY CO.

Desk B Erie, Pa.

FREE LESSON IN DRAFTING

Send for our free lesson which shows how easily you can master Drafting by the Chicago "Tech" Method and prepare for a high salaried job.

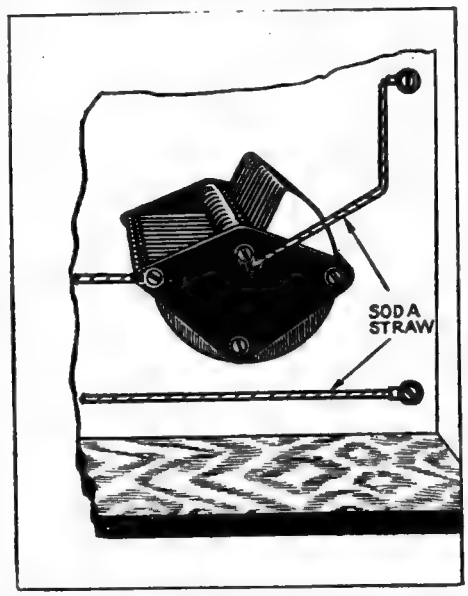
Increase Your Income

You get this pay raising training by mail under the direction of our experts. The fees are moderate, the terms easy. Find out about this now. The lesson is free and we send our catalog with it. Write today.

CHICAGO TECHNICAL COLLEGE

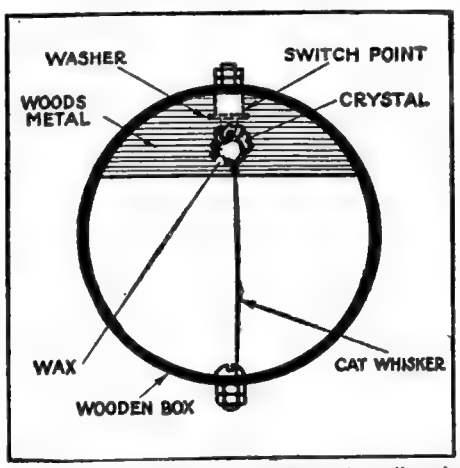
843 CHICAGO "TECH" BUILDING, - CHICAGO, ILLINOIS

SUBSTITUTE SPAGHETTI



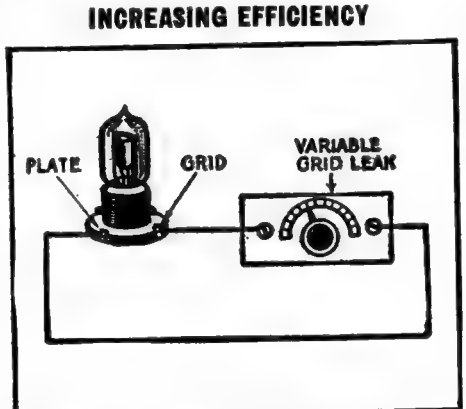
With careful manipulation, ordinary soda straws can be used very successfully as a substitute for the varnished cambric tubing commonly known in radio work as spaghetti. Care must be taken in bending the straws so as not to break them any more than necessary.—C. B. Kramer, Sr. Reporter No. 6349.

FIXED CRYSTAL DETECTOR



A small round wooden box is obtained such as those in which crystals are purchased and two holes drilled in the edges of the base directly across from each other. Place in one of them a switch point to the head of which has been soldered a washer. In the other, place a machine screw to the head of which is soldered a short cat whisker. Place a strip of cardboard across the center of the box to form a mold. Pour into the side on which the switch point and washer are located some melted Woods metal and while still liquid insert a very sensitive crystal. Remove the cardboard and place the detector in a receiving circuit. Adjust the cat whisker, keeping it very short until the signal is loudest, then seal the point of the cat whisker to the crystal with paraffin wax. Place the cover on the base and it is ready for use.

INCREASING EFFICIENCY



The addition of a variable grid leak connected from the plate to the grid of a receiving set will often increase the efficiency many times. This is the system used in the National Monodyne receiver, patented by H. Gernsback, editor of SCIENCE AND INVENTION.

—Earle F. Ruster.

The Hour That Counts!

When you see a man putting in his noon hour learning more about his work, you see a man who won't stay down. He'll never be satisfied until he hits the top. And he'll get there!

In shops, factories, offices, stores, in every line of industry, men are holding splendid positions won through spare-time study with the International Correspondence Schools. To-day they are earning four or five times—yes, some of them *ten* times as much money as when they started.

Employers everywhere are looking for men who really want to get ahead. If *you* want to make more money, show your employer that you're trying to be *worth* more money.

For 32 years the International Correspondence Schools have been training men and women right in their own homes.

Thousands upon thousands of men have stepped up in just this way. More than 180,000 are studying now. Can you afford to let another hour pass without making *your* start toward something better? Here is all we ask—without cost, without obligation, just mark and mail this coupon!

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 6236-C, Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject *before* which I have marked an X:

BUSINESS TRAINING COURSES

☐ Business Management	☐ Salesmanship
☐ Industrial Management	☐ Advertising
☐ Personnel Organization	☐ Better Letters
☐ Traffic Management	☐ Foreign Trade
☐ Business Law	☐ Stenography and Typing
☐ Banking and Banking Law	☐ Business English
☐ Accountancy (including C.P.A.)	☐ Civil Service
☐ Nicholson Cost Accounting	☐ Railway Mail Clerk
☐ Bookkeeping	☐ Common School Subjects
☐ Private Secretary	☐ High School Subjects
☐ Business Spanish ☐ French	☐ Illustrating

TECHNICAL AND INDUSTRIAL COURSES

☐ Electrical Engineering	☐ Architect
☐ Electric Lighting	☐ Blue Print Reading
☐ Mechanical Engineer	☐ Contractor and Builder
☐ Mechanical Draftsman	☐ Architectural Draftsman
☐ Machine Shop Practice	☐ Concrete Builder
☐ Railroad Positions	☐ Structural Engineer
☐ Gas Engine Operating	☐ Chemistry ☐ Pharmacy
☐ Civil Engineer	☐ Automobile Work
☐ Surveying and Mapping	☐ Airplane Engines
☐ Metallurgy ☐ Mining	☐ Agriculture and Poultry
☐ Steam Engineering ☐ Radio	☐ Mathematics

Name.....

Street Address..... 3-27-23

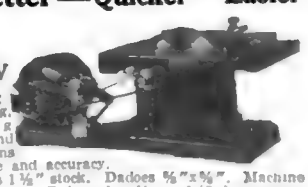
City..... State.....

Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada.

Build It Better—Quicker—Easier

With a JUNIOR BENCH SAW



Does your ripping, mitering, grooving, rabbeting, tenoning, sanding, grinding, and many other operations with surprising ease and accuracy. Top 10"x18". Saws 1½" stock. Dadoes ⅝"x⅝". Machine built entirely of metal. Driven by ¼ or 1/3 hp. motor. Portable. Attaches to any light socket. Extremely accurate.

Descriptive circular tells many things of interest to workers in wood and soft metals

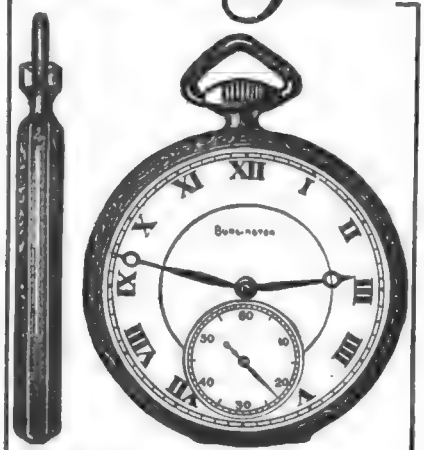
W. & J. Boice, Dept. 5 1730 Norwood Ave., **Toledo, Ohio**

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Digitized by Google

Original from UNIVERSITY OF CHICAGO

21 Jewel Burlington



LOOK!

Adjusted to the Second
Adjusted to Temperature
Adjusted to Isochronism
Adjusted to Positions
21 Ruby and Sapphire Jewels
25 Year Gold Strata Case
Your choice of Dials
(Including Montgomery Railroad Dial)
New Ideas in Thin Cases

Only $1.00 Down

Only One Dollar Down will buy this masterpiece of watch manufacture. The balance you are allowed to pay in small, easy monthly payments. The Burlington — a 21-Jewel Watch — is sold to you at a price much lower than that of other high-grade watches. Besides, you have the selection of the finest thin model designs and latest styles in watch cases. Don't delay! Write for the FREE Watch Book and our *Special Offer* today.

Write

While this Special Offer Lasts

Get the Burlington Watch Book by sending this coupon. Find out about this great special offer which is being made for only a limited time. You will know a great deal more about watch buying when you read this book. You will be able to "steer clear" of the over-priced watches which are no better. Remember, the Burlington is sent to you for only One Dollar down, balance in small monthly payments. Send the coupon for watch book and our special offer Today! Do not delay one minute!

Burlington Watch Co., Dept. 53-35
19th St. and Marshall Blvd., Chicago, Illinois
Canadian Address: 62 Albert St., Winnipeg, Man.

Please send me (without obligations and prepaid) your free book on watches with full explanation of your $1 down offer on the Burlington Watch.

Print name and address plainly

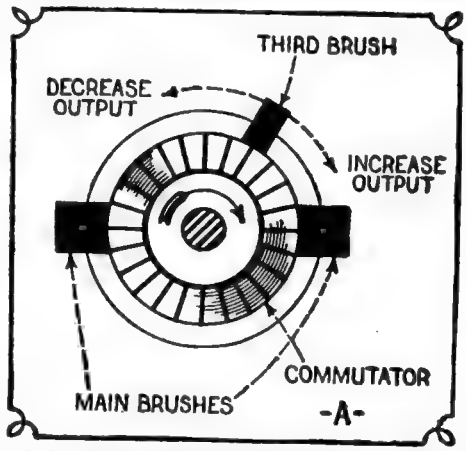
Name _____

Address _____

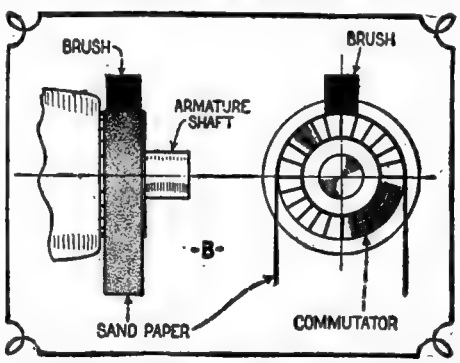
Motor Hints

Generator output and adjustments

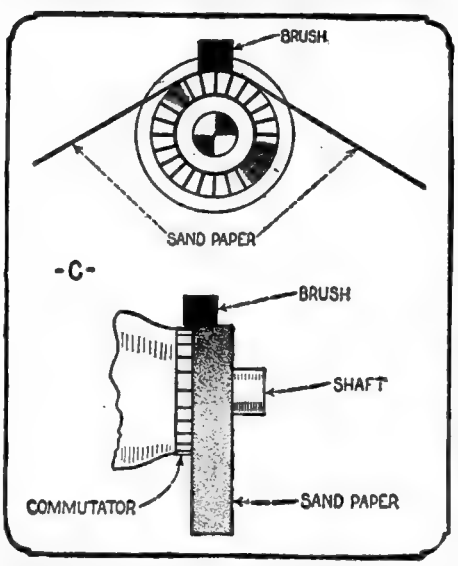
BY TOM C. PLUMRIDGE
Automotive Expert



It is essential that the generator give its best output in the winter, because the battery must be fully charged as the lights burn longer, and the starter has to do harder work in starting the engine in colder weather, and takes more out of the battery. In most generators the third brush is the form of regulation used and the movement of this brush in the direction of the armature rotation will increase the output of the generator. The above sketch shows the brush in position and the directions to move for increasing and decreasing the output.



The brushes of the generator should be a good fit on the commutator and Sketch B shows the correct way to fit these brushes. Emery cloth should never be used because it will imbed particles of emery in the copper and between the bars of the commutator and injure it. Fine grade sand paper should be used.



Cut a strip of sand paper wider than the brush and place under it with the rough side towards the brush and move it back and forwards taking care to keep the strip well around the commutator so that the brush will have the same radius as the commutator. Sketch C shows what to avoid when fitting the brushes.

You can now become a

COMMERCIAL ELECTRICAL ENGINEER

in one year

A new branch of the electrical profession in pressing need of thoroughly trained men. The Commercial Electrical Engineer knows business as well as the technics of electricity. He is the Consulting and Efficiency Engineer, the man who knows commercial engineering problems and how to solve them. Our course specially attractive to high school graduates. You learn here by doing. Our big laboratories are filled with over a quarter of million dollars worth of actual electrical machinery and apparatus, the same as you meet in every-day work. For 18 years, we have been training ambitious men for big-pay electrical jobs.

Electrical Engineering

with B.S. degree in 3 years

The top of the profession. Brilliant careers opened to the man who will dig in and fit himself for this splendid, highly paid field of endeavor. Electrotechnics training 1 to 2 years. Electrical and Mechanical Drafting taught in 9 months. Automotive Electricity, 3 months. Automotive Electrical Engineer, 1 year. Armature Winding and Motor Generator Repair, 3 months. Practical Electricity, 6 months.

A place for every student, regardless of age or education. Faculty of nationally known experts. Individual instruction. Radio Broadcasting station WIAO. Boys—the finest men you'll ever meet—from all over the world come here.

Mail Coupon For Free Books and Complete Information.

SCHOOL of ENGINEERING of Milwaukee

Founded 1905

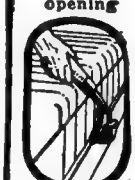
School of Engineering of Milwaukee,
Dept. C402, 415 Marshall St., Milwaukee, Wisconsin.
Without obligating me in any way, please mail free illustrated book and further particulars on course I have checked below.

- ☐ Commercial Electrical Engineering.
- ☐ Automotive Electrical Engineering.
- ☐ Electrical Engineering.
- ☐ Practical Electricity.
- ☐ Drafting.
- ☐ Electrotechnics.
- ☐ Automotive Electricity.
- ☐ 3 Months Armature Winding Course.
- ☐ 3 Months Light and Motor Wiring Course.

Name..... Age.....
Address .....
City .....State .....
Education .....

The Best Seller in the Ford Field

Clamps into tank opening



Fills Tanks without removing cushion

Gas Gauge always in plain sight

Salesmen find Fil-O-Meter increases their earnings over 100%. Manguson made $48.00 in one day; Laux, as a side line, cleared $56.00. Already territory is completely closed in some states. Line up quick with this big money-maker.

Kirstin FOR FORDS FITS ALL MODELS

Fil-O-Meter

A Gasoline Gauge and Filler Combined

fills Ford gas tanks without raising cushion. Gas Gauge always within driver's sight. Basic patents prevent all competition. Weighs 2 pounds. Attaches to any Ford in ten minutes.

$5 Retail—Big Profits

This handsome instrument retails at $5.00 (open cars), $6.00 closed models. (Add 50 cents in West.) You make a liberal commission and are given sales help such as local advertising, circularizing, printed matter, etc.

Territory Closing Fast

Now is the time to get lined up. Write today for complete plans, sales help, etc. On receipt of $1.00 deposit, will ship sample C. O. D. for balance of Distributor's Price.

Dealers! Salesmen! Write or Wire Today!

F9

A. J. KIRSTIN CO.
651 First Street, Escanaba, Mich.

Digitized by Google
Original from UNIVERSITY OF CHICAGO

$2.50 Per Day
and upward

is one reason for the rapidly growing popularity of the Hotel Martinique.

Another is the consistent economy of the entire establishment. Here you may enjoy a Club Breakfast at 45c., consisting of Fruit or Cereal, Bacon and Egg, and Rolls and Coffee—Special Luncheon and Dinners of superior quality are also served at the most moderate possible prices.

No location can be possibly more convenient than that of the Martinique. One block from the Pennsylvania Station (via enclosed subway)—Nine blocks from Grand Central—one block from the greatest and best Shops of the City—half a dozen blocks from the Opera and the leading Theatres—and directly connected with the Subway to any part of the City you wish to reach.

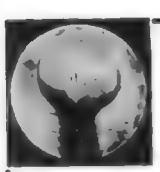
The BEST without extravagance

Hotel Martinique

Affiliated with Hotel McAlpin

Broadway-32nd to 33rd Sts.
NEW YORK

A. E. Singleton, *Manager*



Magnified 225 Diameters

This is what the tip of a fly's leg is like when seen thru the

Wonderful New Ultralens MICROSCOPE

At last the high powered microscope is within the reach of all who wish to study, observe and experiment with the vast world of minute objects that are invisible to the naked eye.

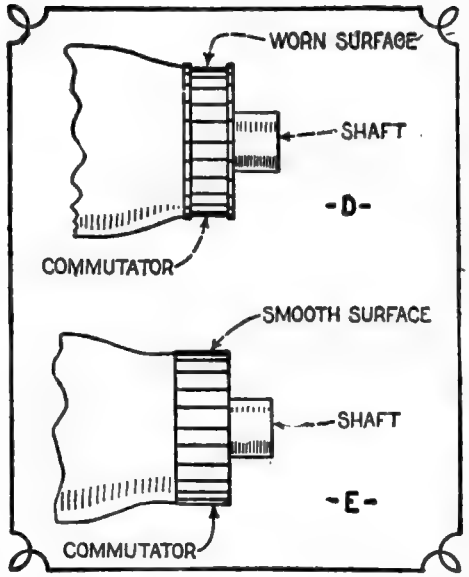
$7.50 for complete Outfit prepaid

Any amateur can immediately start using his Ultralens to examine the edge of a razor, the mesh of a cotton shirt, the bacteria in dirty water. No technical training required, yet hundreds of scientists and teachers are using this instrument today. It is at once interesting, instructive, and scientific. Gives enormous magnification and perfect definition.

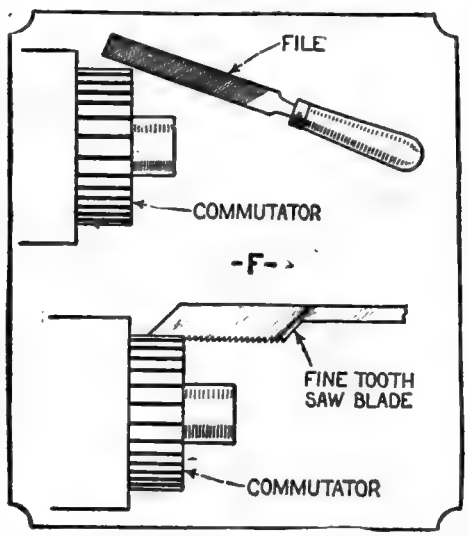
Order Today Order direct from this advertisement and get your Ultralens Microscope now. Fully guaranteed. If, however, you desire more information before purchasing, we will gladly send free descriptive catalog.

SCIENTIFIC APPARATUS CORP.
Dept. 203 Milton, Pa.

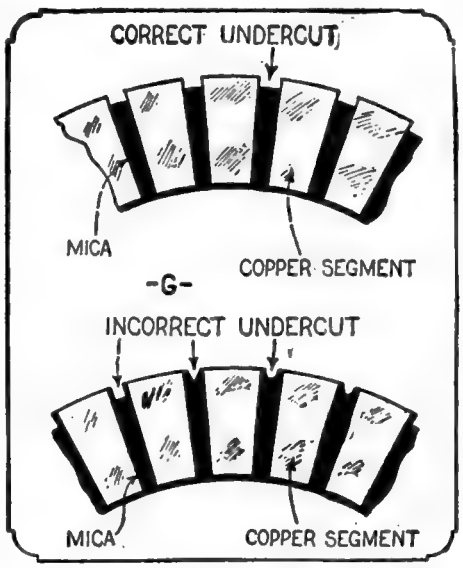
Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.



After a period of service the commutator will become worn down so that it is necessary to take the unit off to have the commutator trued and smoothed up in the latha. This is the cause of low generator output in many cases of generator troubles. Sketch D shows how the generator wears and Sketch E shows how it should be for good operation.



Between the commutator bars there is a hard black substance called mica, and this being harder than the copper does not wear as fast as the copper and in time stands above the bars and prevents the brushes making good contact. Sketch F shows how this mica may be under cut, and the tools to use.



Sketch G shows how the space between the bars should look after the mica has been undercut. Care should be taken to see that a thin strip of mica is not left at the side of the bars because this will be wiped over the bars and prevent good generation.

"I wouldn't sell my course for ten times what I paid for it, if I couldn't get another." Norman Tompsett, Tidiaute, Pa.

WAS $5.00

BOXING
now $1.67

Also Jiu Jitsu and Wrestling

Think of it—over 80 complete lessons in Boxing Jiu-Jitsu and Wrestling—6 big books printed on fine paper and over 200 photographic illustrations—all for $1.67! You can have it on 10-day trial. Send no money.

The greatest secrets of the ring, the best blows and guards used by Jack Dempsey, Benny Leonard, Kid McCoy, Jim Corbett, etc. The fine points of feinting, ducking, clinching, breaking ground, judging distance and timing. Instructions on how to train. And a history of the world's greatest boxers right up to the minute with such famous fights as the Dempsey-Firpo, Firpo-Willard, Dempsey-Gibbons fights, with ring-side views.

This course cuts the time of learning in half. The system is based on the methods used by famous Professor Mike Donovan, former boxing instructor at the New York Athletic Club. So quickly do pupils learn that many outbox bigger and stronger opponents after only a few weeks' training.

Shadow Boxing: To prepare you for your first test, The Stillman Course also puts you through three fast rounds of shadow boxing—great exercise for producing speed, wind and confidence.

Jiu-Jitsu and Wrestling—how to subdue an armed opponent, how to throw an opponent who grabs you from behind, the Gotch Toe-Hold, the Stecher Scissors Hold, the Head-lock, etc.

And to build you up physically, you're given a complete set of muscle-building and breathing exercises.

SEND NO MONEY: Simply fill in and mail the coupon. When you have the course in your hands, deposit $1.67 (plus the actual postage) with the postman. Use the course for 10 days—try it out thoroughly. If for any reason, you are not entirely satisfied, return the course, and get your money back at once. Mail the coupon now to The Stillman Association, Dept. 1424-E, 50 East 42nd Street, New York.

10-DAY TRIAL

THE STILLMAN ASSOCIATION
Dept. 1424-E, 50 East 42nd St., New York

Send me on approval the The Stillman Course. When I have the course in my hands, I will deposit $1.67 (plus the actual postage) with the postman, with the understanding that if, after 10 days, I wish to return the course, I may do so and my deposit will be instantly refunded. If I keep the course there is nothing further to pay.

Name .....

Address .....

Canadian and foreign orders must be accompanied by cash ($1.67 U. S. funds) subject to money back guarantee if not entirely satisfactory.

ONLY $15.45
32.20 or 38 Cal. 6 Shots

TORPEDO
Side Swing Cylinder Revolver made of Bilbao blue steel. Send for this accurate, dependable and powerful gun, with insection plate and automatic hammer safety.
SEND NO MONEY — Pay postman on arrival $14.75 plus postage. *Satisfaction guaranteed or money back.* NEW YORK IMPORTERS CO.
Dept. 451M, 200 Broadway, New York City
Free Catalog

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

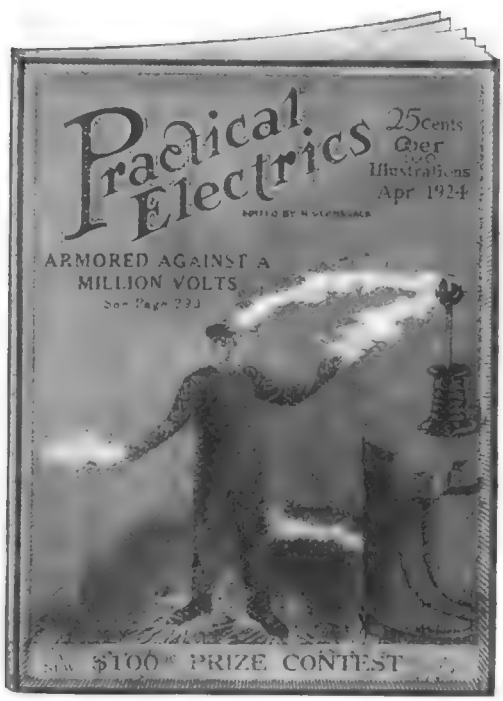
Digitized by Google Original from UNIVERSITY OF CHICAGO

Electrical Mysteries

There is hardly a branch of Modern Science that is so full of unexplained mysteries as Electricity. No field offers such a big, worth-while opportunity for the **Amateur Experimenter** or student.

PRACTICAL ELECTRICS, the most novel magazine of its kind, explains the tremendous field of electricity in the clear language you understand. It brings the big Electrical World to your home.

PRACTICAL ELECTRICS tells about Edison and all the Prominent Electrical Men. It makes every Reader acquainted with the Day-by-Day advance of Electricity.



SEND FOR FREE SAMPLE COPY

or

Take Advantage of This Special Offer

S. & I. 5-24

SPECIAL OFFER

GERMOTT PUB. CO.,
53 Park Place, New York City

Gentlemen:

Although your regular price is $2.50 per year, you will accept my subscription at $2.00 per year (Canada and foreign, $2.50). I enclose the money herewith and I have written my name and address in margin below.

Name .....

Address .....

THE APRIL ISSUE OF PRACTICAL ELECTRICS

Contains Over 50 Big Features among which are—

HIGH TENSION ARMOR
DETECTION OF ICEBERGS
INFRA RED LIGHT TELEPHONY
DEMOUNTABLE STORAGE BATTERY
HOT WIRE AMMETER
ELECTRIC PIANO, ETC.

PRIZES

This magazine offers a number of prizes, as follows:
$100 Old Telephone Receiver Contest.
Our $50.00 Prize Contest for Junior Electricians and Electrical Experimenters includes as its elements simplicity, as great a degree of novelty as possible, and practicability.
Also a new prize contest giving four prizes amounting to $37.50 for the best account of an odd electrical experience.
$3.00 for the best article on Elec-Tricks, the new department.
$3.00 for the best "short-circuit," the semi-humorous department.
In addition to this, the magazine pays high prices for all electrical experiments, electrical articles, etc. See current issue for full details.
This Magazine is Edited by H. GERNSBACK, also Editor of RADIO NEWS and SCIENCE and INVENTION.

For Sale At All News Stands

25c. the Copy **$2.50 a Year**
Canada and Foreign—$3.00 a Year

GERMOTT PUBLISHING CO.
Successors to PRACTICAL ELECTRICS CO.
53 Park Place **New York City**

Digitized by Google
Original from UNIVERSITY OF CHICAGO

$3 down brings genuine

UNDERWOOD

Yes, only $3 down puts this genuine standard Shipman-Ward Rebuilt Underwood in your home. Then—small monthly payments, or if convenient, pay cash. Either way you get the *world's standard* typewriter at a big cash saving.

WHY PAY RENTAL?

Think of it! You pay little more than rental, and the machine is yours! We offer the same three models of the Underwood Typewriter which are being made and sold by the Underwood Company today. The only difference is that Shipman-Ward machines are priced lower and are rebuilt like new by experts. You can't tell them from brand new machines. Visible writing—the FULL LINE of typewriting is visible at all times. STANDARD 4-ROW SINGLE SHIFT KEYBOARD. Two color ribbon, back spacer, stencil devices, automatic ribbon reverse, tabulator, etc.

TEN DAYS' FREE TRIAL

See for yourself! Try the typewriter ten days. You must be satisfied or the entire transaction won't cost you a penny. Act today. Get our big illustrated catalog and full particulars. Write NOW.

FREE TRIAL COUPON

Typewriter Emporium
SHIPMAN-WARD MFG. CO.
2165 Shipman Bldg., CHICAGO

Send by return mail Bargain Offer No. 2161 of a Standard Visible Writing Underwood. This is not an order and does not obligate me to buy.

Name.....

Street or R. F. D. No.....

Postoffice..... State.....

Learn to Draw at Home

New Method Makes It Amazingly Easy

Trained artists earn from $50 to over $250 a week. Tremendous demand right now for good art work. Magazines, newspapers, advertisers, printing houses, etc.

Become an artist through wonderful new easy method—right at home in spare time. Learn Illustrating, Designing and Cartooning. Actual fun learning this way. Individual attention by mail from one of America's most famous artists. Learn to draw and earn big money.

Send for FREE BOOK

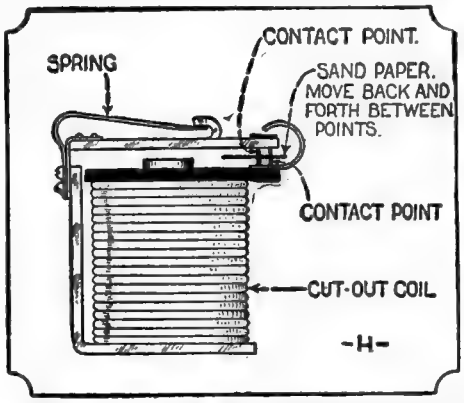
Just printed—a new book which describes the latest developments and wonderful opportunities in Commercial Art, and gives full details on this new easy method of learning to draw. Tells all about students—their successes—what they say—actual reproductions of their work—and how many earned big money even while learning. Write for this Free Book and details of special free offer. Mail post-card or letter *now*.

WASHINGTON SCHOOL OF ART
Room 265, 1115-15th St. N. W., Washington, D. C.

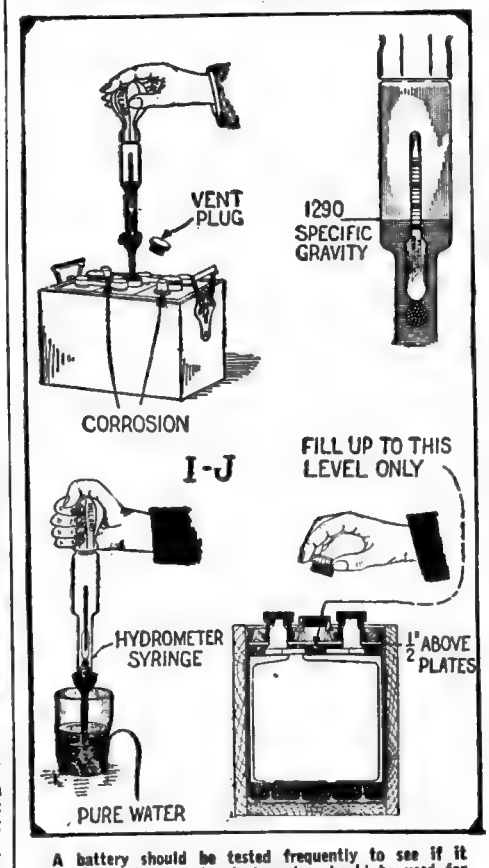
Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Motor Hints

(*Continued from page* 100)



There is an important unit in connection with the generator which controls the connecting of the battery with the generator when the car reaches a certain speed, and does it automatically. This unit is called a cutout. The contact points on it should be clean and make perfect contact with each other. Sketch H shows how these contacts may be cleaned. If this little device should fail to operate the car should not be run until the trouble has been corrected because the generator windings will heat up and burn up the insulation. To clean the points draw a strip of sand paper between the surfaces of the points, while lightly pressing the points together.



A battery should be tested frequently to see if it is fully charged and a hydrometer should be used for this purpose, and Sketch J shows how the test should be made for both the depth of solution test and the hydrometer test. If the battery is fully charged the hydrometer will show a specific gravity of 1.290. A battery should never be allowed to get below a specific gravity of 1.200. Use only distilled water to fill the battery.

WANTED!!! RADIO ARTICLES

WE want descriptions of new radio ideas which you have worked out in practice. Take photographs of the important parts and make pencil or pen and ink sketches of the hook-ups or mechanical details, et cetera. We are particularly desirous of obtaining new hook-ups and descriptions of single tube sets, reflex and other types which have proven satisfactory. We want articles on the latest single tube receptors which require a minimum current from the filament battery.—Editor.

Become An

Automotive Electrical Engineer

A new calling of men who know the theory and practice of Electricity as it applies to the automobile. They are scientific experts who know all there is to know about automotive electrical equipment. They work with automobile and electrical equipment manufacturers in designing, making, installing, repairing and servicing automotive electrical devices of all types. Some work at factories, some travel as Service Supervisors, going about advising with dealers and distributors. Some are connected with large garages and service stations. It is a fascinating field of endeavors and commands large salaries. Some set up businesses of their own.

1 Year Intensive Training

To fill these big jobs, you must have training, the **right kind of authoritative, specialized, practical training.** Here you will be trained by nationally known experts whose skill and ability are widely recognized. Every step of this important subject is treated in the most thorough and intensive way. When you leave the school, you are fitted to start right into a big-pay job or set up a paying business of your own.

Automotive Electrician 3 Months' Training

A practical course in Starting, Lighting, Ignition and Storage Batteries. Fits man for good-pay job in garage, service station or factory. Automotive Electricians are in demand everywhere and trained men are the only kind that are wanted. If you want a quick, but practical course, select this one.

SCHOOL OF AUTOMOTIVE ELECTRICITY INC.
Associated with the
SCHOOL OF ENGINEERING OF MILWAUKEE
Dept. A 502, 415 Marshall Street, Milwaukee, Wisc.

FREE BOOK COUPON

SCHOOL OF AUTOMOTIVE ELECTRICITY, Inc., Dept. A 502, 415 Marshall Street, Milwaukee, Wisc. Please send me by return mail without obligation to me your book on Automotive Electricity. Am interested in courses checked below.

Automotive Electrical Engineer. Automotive Electrician.

Name .....Age .....

Address .....

City .....State .....

Education .....

Now you can get a Photo-Electric Cell

Here's a real commercial photo-electric cell of the gas Ionic type that can be used for modulation in wireless transmission. Also in telephotography, television, stellar photometry, spectrum analysis, for burglar alarms, light buoy operation, etc.

Remarkably stable to voltage changes, while responding in direct proportion to variations in light intensity of normal wave lengths.

Type B-1 Photo-Electric Cell with single contact Edliswan base $17.50. Ediswan Receptacle $1.00.

$17.50

Descriptive circular on request.

General Research Laboratories
326 River Street Chicago

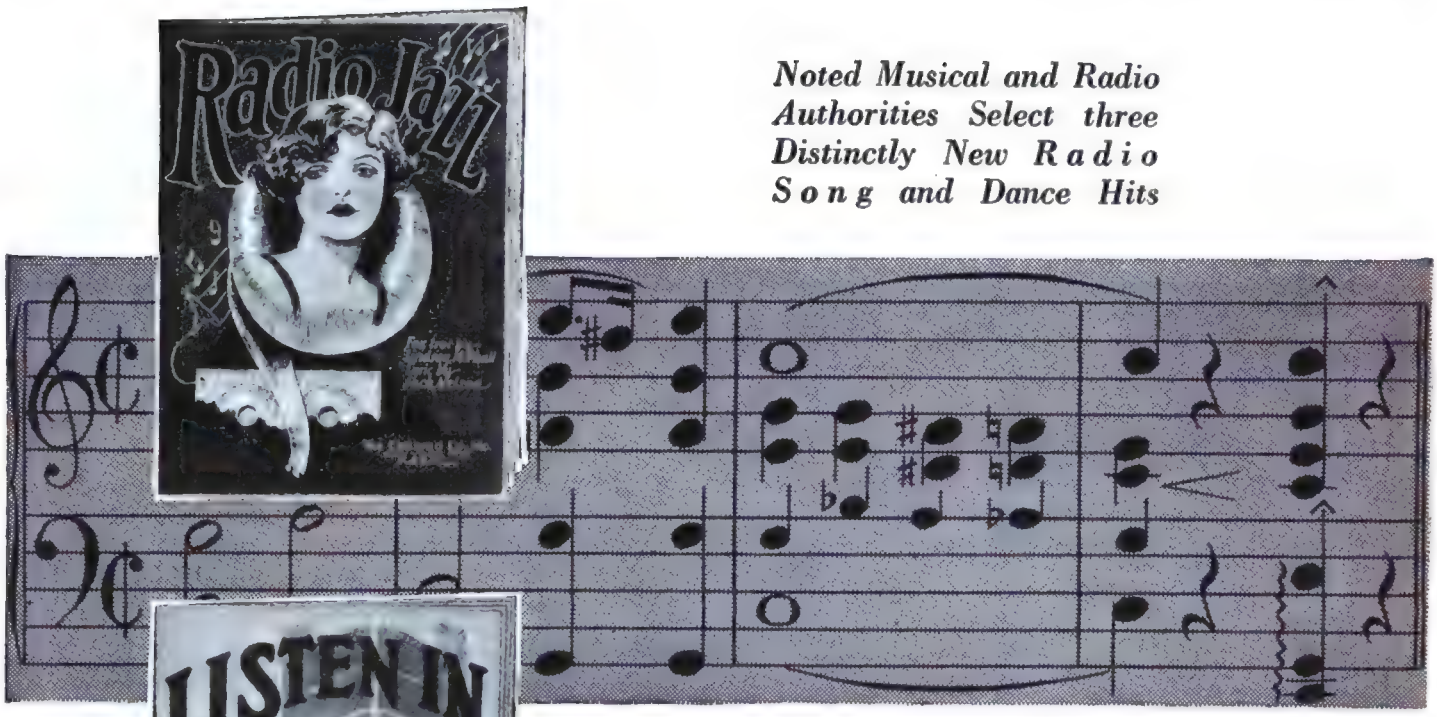
WANTED!

The Editor requires for his personal use in his library, the following copies of the

ELECTRICAL EXPERIMENTER

May, June, July, August, September, October, November and December, 1913, January and February, 1914. If you have these copies, kindly communicate with the Editor, stating the value you place upon them. Address.

Mr. H. GERNSBACK
53 Park Place New York City

Digitized by Google Original from UNIVERSITY OF CHICAGO

Noted Musical and Radio Authorities Select three Distinctly New Radio Song and Dance Hits

Now We Have *Radio* Song and Dance Hits

35c EACH Postpaid

In a recent nation-wide Musical Radio Contest three compositions were selected from the hundreds of Manuscripts submitted as prize winners. These numbers have now been published in the conventional form so that Radio Music Lovers and also Music Lovers everywhere can enjoy these distinctly new hits in Popular Music.

These prize Radio Hits will be a sensation in your dance folio. They offer you the opportunity of buying three fine melodies at the same time each better than the other. It were as if you had picked the choice numbers out of hundreds of songs at your dealer.

These Radio Song and Dance hits will be exclusively Radio—To and for the Radio Public. They will be Broadcast from your local Broadcasting station. Listen in for them. Your local Radio Dealer will have copies for you. Look them over the next time you visit him or write us direct for your copies.

Published and Distributed by

THE CONSRAD COMPANY, INC.

233 Fulton Street, New York City

Radio Jazz:

Irresistible foxtrot. One of the prize winners of RADIO NEWS Broadcast contest! Young feet dance—old feet tap time, to the fascinating melody of this real smashing hit.

Listen In:

Featured in RADIO NEWS Broadcast contest, has caught the fancy of all America! Its rare swing hypnotizes—and its tuneful melody makes it simply irresistible.

Radio March:

Another Prize Winner of RADIO NEWS Broadcast contest. Here, music lovers, is a wonderful number! Is there anything so appealing as the stirring strains of a military march?

Digitized by Google
Original from UNIVERSITY OF CHICAGO

YOU CAN LEARN NEWSPAPER WORK

Experienced Editor Will Teach You How to Become a Reporter

FASCINATING WORK--GOOD PAY

Only a Few Months' Work Required To Qualify You for a Better Position

Regular reporters earn from $40 to $125 a week. Good deskmen on a daily paper are paid from $60 to $100 a week. A "Star" Reporter can command his own salary. Hundreds of ambitious men and women enhance their income materially by corresponding for newspapers or writing for magazines in their spare time.

We Will Teach You at Home

We can develop your talent for writing and lead you into this well paying profession. Our Practical Course in Journalism was personally prepared by Henry J. Brockmeyer, Assistant City Editor of the New York Evening Post. Mr. Brockmeyer has trained hundreds of men and women, many of whom have, under his guidance, developed into front rank reporters or feature writers.

Mr. Brockmeyer's course will teach you what it would take years of actual newspaper work to learn. It consists of six comprehensive lessons just brimful of everything a reporter must learn. The following are only a few of the subjects covered.

Starting in Journalism. What is a Newspaper? What is News? Start and Finish of a News Story. Technical Terms. The Type Point System. Styles of Type, Proof Reading. Capitalization and Punctuation. A Late Fire Bulletin. Court Stories. Libel Laws, Copyright. Hints to Reporters. Personal Conduct. Re-Writing and Condensing Stories. Paragraphs and Short Items. Good and Bad Styles. Broadening the Vocabulary. Aids to Good Style. Special Stories. Suggestions for Stories. Rhetoric. Preparing Your Story. Don'ts for Writers. Office Organization. Syndicated Matter. Business Office. Mechanical Department. Hints for Headline Writers. The Make-Up. The Country Correspondent, etc., etc.

Use Coupon—Save 50%

Although the price for the entire course is $10, entitling the student to full consulting services directed by Mr. Brockmeyer personally, we will accept enrollments, if the coupon below is used before June 20, at $5—exactly half price.

Five Days' Trial

Just pin a check, money order or five dollar bill to the coupon below and mail. Then take five days after the course arrives to decide whether you want to keep it. If not, return it at our expense and your money will be immediately refunded.

THE PRESS GUILD, Inc., 66-S West Broadway, N. Y.

THE PRESS GUILD, Inc. (Expires June 20, 1924)
66-S West Broadway, New York City.

Enclosed find $5 for which you are to ship me at once, prepaid, Henry J. Brockmeyer's complete course in Practical Journalism with the distinct understanding that if I return the course in five days my full $5 will be refunded and no questions asked.

(Name) .....

(Address) .....

(City) .....(State).....

Answer to Scientific Puzzles

By ERNEST K. CHAPIN

(*Continued from page* 43)

THE WHEEL PROBLEM

The upper part of the wheel at A is just twice as far from the center of rotation B as is the center of the wheel. Therefore the upper part will travel just twice as fast as the center. Any given point has this double speed only for the instant it is vertically above the point of contact with the ground.

THE LEVER PROBLEM

The lever system shown above is more effective in the development of force than the one below because in the former the effort is applied at the greater distance from the pivot. Thus greater leverage is obtained by the method of the upper system.

JUMPING UPWARD ON A MOVING TRUCK

On jumping upward from a moving object such as a truck a person's body retains the same velocity as that of the moving object. Hence, neglecting the resistance of the air, a person will keep up with the moving object and land back in precisely the same spot as that from which he leaped.

SKATING ON THIN ICE

When thin ice sags and breaks under the weight of a person standing on it, the water below the ice must have time to move out from under the crust of ice. A fast skater may easily skim over a dangerous spot before the water below has had a chance to give way or yield to the pressure of the bending crust.

THE WATER PIPE

It is at once apparent that the rate of flow or quantity of water that passes per second in any one part of a pipe must be exactly equal to the rate of flow in any other. Otherwise there would be an accumulation of liquid in some places and not in others. Yet this is just what would happen if water were to flow as shown in the diagram, for at A where the water is flowing out of the pipe into the casing the pipe would not contain enough water to fill it while at B where the water is re-entering the pipe there would be more water supplied to the exit pipe than it could accommodate.

THE ELECTRIC LAMP

The former problem is in a sense a water analogy of the action that prevents the filament of an electric lamp from being shorted by the electronic atmosphere which it produces. The filament corresponds to the pipe, the glass bulb to the casing, and the electron stream within the filament to the current of water within the pipe. The heat of the filament drives electrons out into the space surrounding it until they are so numerous as to return to the filament just as fast as they are ejected from it. Under such conditions any general movement of electrons between the different parts of the filament would be impossible.

THE EARTH AND THE TUB OF WATER

The daily rotation of the earth would not cause water to circulate once every twenty-four hours inside a tub placed at the north pole because the water like everything else would have the rotational velocity of the earth even before it was introduced into the vessel. Hence as the earth turned the tub around every twenty-four hours the water would rotate once also and thus keep up to the motion of the container.

THE U-TUBE OF MERCURY

If capillary action is sufficient to maintain the difference in the levels of the mercury columns it will be sufficient to keep the mercury from flowing down through the tube A joining the two columns.

A QUESTION OF STABILITY

The stability of an object, in general, depends upon the size of the base and the

(*Continued on page* 107)

Learn Electricity by Actual Work

In 3½ Months At Coyne

Earn $65 to $200

A Week, Or Go In Business For Yourself And Make

$3,500 to $15,000

A Year

Yes, 3½ months at the **Great School of Coyne**, located in Chicago, The Electrical Center of the World, will make you an **Electrical Expert** capable of commanding big pay. The whole world of electricity is open to the practical man—the man who has had actual experience with electrical apparatus. Coyne gives you a practical training on the greatest outlay of electrical apparatus of any institution in the World; everything from door bells to power plants.

Not a Correspondence School

We don't make you a mere "paper" electrician. We train you by practice on our mammoth outlay of actual equipment. We train you in house-wiring by having you do it exactly as it is done outside — not just by reading about it. The same applies to armature winding, power plant operating, motor installations, automotive work and hundreds of electrical jobs. That's why we can train you to become a **Master Electrical Expert.**

No Books—No Lessons — No Classes

You Do Actual Work

The Coyne practical course includes no books, printed lessons or useless theory. We train you to work with your head and hands on the same kind of electrical apparatus as you will find "out in the field". Age, lack of experience or education is no drawback. Our students range from 16 to 60 years of age. Coyne gives you Free, a Life Scholarship which enables you to stay as long as you want without extra charge or return later for more practice, and assists you to a position after graduation. Free Radio Course included.

Earn while you Learn! *We help students to secure jobs to earn a good part of their living expenses while studying.*

Send Coupon Now

Send coupon today for big Free Book and full details of our special offer of Free Railroad Fare. Act now!

COYNE ELECTRICAL SCHOOL
1300-1310 West Harrison St., Dept. 53-35, Chicago, Ill.

Free R. R. Fare

COYNE ELECTRICAL SCHOOL, Dept. 53-35
1300-1310 W. Harrison St., Chicago, Ill.
Gentlemen: Please send me free your big catalog and your special offer of free railroad fare.

Name.....

Address.....

.....

Digitized by Google
Original from UNIVERSITY OF CHICAGO

RADIO NEWS

THESE FOREMOST RADIO AUTHORITIES TELL OF THEIR RESEARCH AND SCIENTIFIC DEVELOPMENTS IN RADIO NEWS.

Read their exclusive articles in Radio News

SIR OLIVER LODGE, F.R.S., LL.D., D.Sc.
J. A. FLEMING, M.A., D.Sc., F.R.S.
DR. LEE DE FOREST, Ph.D., I.R.E.
PROF. JOHN M. MORECROFT, I.R.E.
GEN. GEORGE O. SQUIER
JOHN SCOTT-TAGGART, F.Inst.P., I.R.E.
EDWIN H. ARMSTRONG, I.R.E.
JOHN L. REINARTZ
DR. KARL ROTTGARDT
JOHN V. L. HOGAN
PROF. RENE MESNY
PROF. W. P. POWERS

and over 100 other prominent contributors

"RADIO NEWS" Is Radio's Greatest Magazine, Over 150 Pages of Radio with over 200 illustrations.

SEND FOR FREE SAMPLE COPY

"RADIO NEWS" has the largest Advertising display of any Radio Magazine. The circulation of "RADIO NEWS" is over 130,000 greater than the nearest competitor. "RADIO NEWS" excels in these vital departments because it covers all the live interesting news of Radio Broadcast and Amateur and Professional Reception.

"RADIO NEWS" can be obtained at the nearest newsstand for 25c the copy. Subscriptions are $2.50 per year. "RADIO NEWS" appears on all newsstands the tenth of the preceding month.

EXPERIMENTER PUBLISHING CO., INC.
53 PARK PLACE :: NEW YORK CITY

Digitized by Google
Original from UNIVERSITY OF CHICAGO

Choose as Your Profession

ELECTRICAL ENGINEERING

Electricity offers a brilliant future to the young man who is about to choose his career. Never before has there been such wonderful opportunity in this great field. Big paying positions in electrical work the world over are open to trained men — men who possess specialized, practical knowledge. Come to the School of Engineering of Milwaukee — the largest and best equipped electrical school in America. Here you are trained in both theory and practice by a faculty of experts. You learn in large, finely equipped laboratories. If you have 14 high school credits or equivalent, you can become an Electrical Engineer with a Bachelor of Science degree in 3 years. If you lack these credits they can be made up in our Institute of Electrotechnics in a short, intensive course.

B. S. Degree In 3 Years

Earn While You Learn

By our special system you may earn your way while learning. Our Employment Department will secure you a position to which you may devote a part of each day, spending the remainder at the school. This plan both solves the students' financial problems and provides splendid experience at the same time. Low tuition fee. Board and room reasonable. Daily Broadcasting WIAO. School Orchestra. Fraternities.

Summer Term Begins July 1st.

Write for Free Catalog

Write today for our free, illustrated catalog. Read about this wonderful institution and the great opportunities that lie before you. Find out about our specialized method of training and the details of our "Earn While You Learn" plan.

SCHOOL of ENGINEERING of Milwaukee

Founded 1905

Dept. E-202, 415 Marshall St., Milwaukee, Wis.

School of Engineering of Milwaukee,
Dept. E-202, 415 Marshall St., Milwaukee, Wis.

Please send me your free illustrated catalog on Electrical Engineering and give me the details of your "Earn While You Learn" plan.

Name .....

Address .....

Town ..... State .....

Age ..... Education .....

MOTOR CAMPER & TOURIST

The only magazine that covers the entire field of Touring and Camping by Motor.

Tells you where to go in your car, the best route to take and how to get the most pleasure from the trip.

First Issue, June—out May 15th

On all newsstands 25c the copy.
By subscription $2.50 per year.

GERMOTT PUBLISHING CO.
Successors to Practical Electrics Co.

53 PARK PLACE NEW YORK CITY

Answers to Scientific Puzzles

(*Continued from page* 105)

height of the center of gravity of the object above the base. The larger the base the greater is the stability. And the higher the center of gravity the less is the stability. Hence the ratio of diameter of base to height of the center of gravity of the object may be taken as an index of its stability, provided, of course, that the center of gravity is directly over the center of the base as it is in the problem of the pedestal.

If the center of gravity of an object has to be raised in order to overturn it the object is said to be stable. And the higher the center of gravity has to be raised the greater is its stability. Now from the accompanying figure it will be seen that if the pedestal stands on its small base the center of gravity will have to be raised a distance equal to $\sqrt{1\frac{1}{16}}-1$, or about 0.03 feet, while if it stands on its big base the center of gravity will have to be raised $\sqrt{4\frac{1}{4}}-2$, or about 0.06 feet. Hence it is more stable on its larger base.

The Heavens in May

BY ISABEL M. LEWIS, M.A.

(*Continued from page* 32)

than Spica but a little fainter than Arcturus, which lies not far to the northward. Arcturus is the brilliant orange-colored star in the kite-shaped group of Boötes the Herdsman.

The brilliant blue-white Vega in Lyra, now well above the horizon in the northeast, Capella in Auriga, far over in the northwest and Arcturus, are the three brightest stars of the northern hemisphere. Capella and Arcturus are estimated to be exactly equal in brightness and a shade less brilliant than Vega. There is considerable uncertainty as to the exact distance of Arcturus from the earth. According to some measurements it is less than 20 light years distant and to others nearly 40 light years away. It is one of the most rapidly moving stars. Since the days of Ptolemy, Arcturus has moved in relation to the other stars in its constellation a distance greater than twice the diameter of the moon. Though this is considered to be an unusually large motion for a star, it is less than that of a considerable number of stars. Arcturus is also one of the cooler stars, its surface temperature being about 4,000 degrees.

The Northern Crown, Corona Borealis, is now high in the heavens to the northeast of Boötes. It consists of an almost perfect semicircle of stars. Its brightest star, the jewel in the crown, is a star of the second magnitude called Gemma. The large constellation of Hercules which follows Corona on the northeast contains many stars of third and fourth magnitude, but none brighter. It also contains one of the finest star clusters in the heavens, known as the Great Hercules cluster, visible faintly even to the naked eye. Adjoining Hercules on the northeast is the beautiful little constellation of Lyra, the Lyre, with its magnificent blue-white Vega.

Turning to the south, we see all of the huge form of Hydra, the Water-snake, now fully above the horizon and extending almost entirely across the southern heavens from the southwest to the southeast. Alphard, its brightest star—a second magnitude one—stands alone in the southwest. Hydra's riders, the small constellations of Corvus and Crater, are now almost due south.

Price Cut ½ On World's Greatest Reference Books

For Any Line of Work

Latest Edition

Let experts work for you—in these books you will find the most remarkable collection of practical job experience and vital knowledge that was ever assembled in book form. More than 200 of the greatest engineers, lawyers, business men, and practical experts—all of them men who have gone through the mill—give you in these books a life-time of valuable inside information on the line of work in which you want to get ahead. Make their knowledge and experience your own. Let them show you all the newest methods—the best ways of doing things. This very minute you may be up against some tough problem—if you had these books you would solve it instantly. Send the coupon for

A Week's *Free* Trial

Just fill out the coupon and we will immediately send you any one of these libraries express collect. Read the books over carefully. Test them out thoroughly for seven days. If you do not want them, send them back at our expense. If you decide that they will do for you what they have done for 280,000 other men to whom they brought more money and success, pay $2.80 within one week and $3.00 a month thereafter until the special price is paid. This amounts to only 10c a day. Mail the coupon NOW if you want a bigger, better job and bigger pay.

Free Consulting Membership

A resident staff of from 15 to 20 practical experts is waiting to solve for you any difficulty that you may have. A letter or a wire to American Technical Society will bring you an immediate answer and the solution to your problems. This advisory staff of practical men plus your working and reference library will enable you to handle successfully any job in your line. These men know all the latest methods and the newest and best ways of doing things. Let this pay-raising consulting staff be YOUR SILENT PARTNER.

This free consulting membership offer is good for a limited time only and can be withdrawn without notice.

Your Choice 75c a Week

5 vols. Carpentry and Contracting—was $37.50 now.....19.80
12 vols. American Law and Practice (including free reading course and 250 page book of standard legal forms)—was $97.50 now.....49.80
6 vols. Applied Electricity—was $60.00 now 29.80
6 vols. Auto Engineering —was $45.00 now 21.80
9 vols. Civil Engineering —was $67.50 now 34.80
8 vols. Business Management—was $52.50 now 29.80
7 vols. Steam and Gas Engineering—was $52.50 now.....24.80
4 vols. Sanitation, Heating and Ventilating—was $30.00 now. 14.80
4 vols. Fire Prevention and Insurance — was $30.00 now.....14.80
6 vols. Modern Machine Shop Practice — was $45.00 now.....21.80
4 vols. Telephone and Telegraphy—was $30.00 now.....14.80
4 vols. Drawing—was $30.00 now..... 14.80

Send No Money

Here is your opportunity if you want to earn more money. Remember we are taking all the chance—you pay nothing until you are thoroughly convinced that these books will help you to greatly increase your pay. Isn't this about the fairest proposition that was ever made you?

American Technical Society

Dept. X-525, Chicago, Ill.

© A.T.S. 1923

AMERICAN TECHNICAL SOCIETY,
Dept. X-525, Chicago.

Please send me a set of ..... for seven days' FREE EXAMINATION, shipping charges collect. I will examine these books thoroughly, and if satisfied will send $2.80 within seven days and $3.00 a month until I have paid the special price of $..... If I decide not to keep the books, I will return them within one week at your expense. It is understood that if I keep the books I am entitled to a FREE Consulting Membership in the American Technical Society.

Name .....

Address .....

Reference .....

(Please fill out all lines, give local merchant, banker, or employer as reference.)

Digitized by Google
Original from UNIVERSITY OF CHICAGO

We Teach COMMERCIAL ART

Meyer Both Company, the largest Commercial Art Organization in the World offers you an unusual opportunity for practical training, based upon twenty-three years of success. This nationally known organization each year produces and sells to advertisers over 15,000 commercial drawings. Meyer Both instruction is the difference between successful fact and experimental theory. This well paid profession equally open to men and women. Home study instruction.

Get Facts Before You Enroll in Any School

Ask the Advertising Manager of the leading newspapers in your city, anywhere in the United States, Canada, England or Australia about the Meyer Both Company—let them tell you about us. Write for our illustrated book telling about the success of our students—for one-half the cost of mailing—four cents in stamps.

MEYER BOTH COMPANY
Department of Art Instruction
Michigan Ave. at 19th St., Dept. 64 CHICAGO, ILL.
Note—To Art and Engraving Firms: Secure practical artists among our graduates. Write us.

SEND NO MONEY FOR THESE AUTOMATICS

Lowest Prices in the Country

20 SHOT MILITARY MODEL 32 cal. with Extra Magazine FREE $8.45

25 Cal. 6-Shot BLUE STEEL..$6.65
25 Cal. 8-Shot MAUSER 11.50

CYLINDER SWINGS OUT — Best Grade 6 SHOT HAND EJECTOR
32 Cal. $15.45 — 32-20 OR 38 Cal. $16.45

32 or 38 Cal. Break-Open REVOLVER $8.25

6 SHOT Hand Ejector 32, 32-20 or 38 Cal. Specially Reduced $12.25

GENUINE GERMAN 30 Cal. 9 SHOT LUGER $21.00

Brand New Guns Use Standard Ammunition

Satisfaction Guaranteed or Money Refunded
Pay Postman Our Price Plus Postage

EDWARDS IMPORT TRADING CORP.
258 BROADWAY Dept. 944 NEW YORK CITY

$1 Postpaid with Instructions

SEND FOR YOUR FREE COPY

TESTED HOOK-UPS

SUBMITTED BY USERS OF OUR
WONDERFUL TRANSMITTER BUTTON FOR LOUD SPEAKERS AMPLIFICATION EXPERIMENTS

K. ELECTRIC CO.
15 PARK ROW NEW YORK

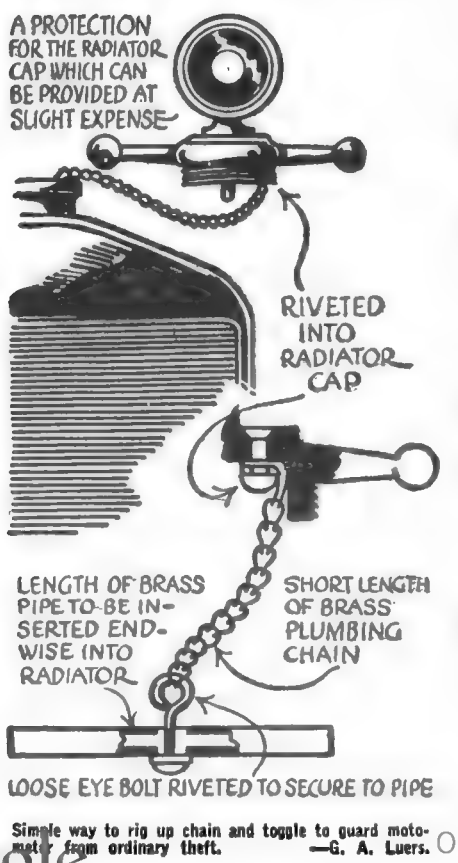
2650 Miles ON ONE TUBE Broadcasting from Atlantic Coast, Mexico, Canada, Cuba and Hawaii, heard in California by users of CROSS-COUNTRY CIRCUIT. Atlantic Coast users hear California. Range due to simplicity of set and operation by only one tuning control. Easy and cheap to build by any novice. Dry cell tubes may be used. Complete understandable instructions, full size panel layout, assembly photo, etc. Postpaid. 25c.; Stamps accepted.

VESCO RADIO SHOP
Box G. I. 117 OAKLAND, CALIF.

The last of our old friends of the winter months are approaching the western horizon. Sirius is gone but Procyon may still be found low in the southwest. Capella, in Auriga, is now nearing the northwestern horizon. Perseus is on the horizon and fast disappearing from view, but Castor and Pollux, in Gemini, are still well above the western horizon. Venus, in all its splendor, may now be seen at the time for which our chart is given, to the northwest of Castor and Pollux. It passes from Taurus into Gemini this month and reaches its greatest brilliancy on the 24th of May. There will be no difficulty about identifying Venus, because, as always, it surpasses all other stellar objects in brightness. Jupiter, though not visible at the time for which the chart is made, will come above the southeastern horizon very shortly, as it is now in the constellation of Ophiuchus, which is just appearing in the east, following closely upon Serpens. Mars is now in Capricornus and rises before midnight, but is not visible at the time designated on the chart. It is rapidly increasing in brightness and even now outshines all other stellar objects with the exceptions of Venus and Jupiter, Sirius and Canopus. When it reaches opposition in August it will outshine all of these excepting Venus. The distance of Mars at the coming opposition is very nearly the closest possible approach for this planet.

Of special interest this month will be the transit of Mercury across the face of the sun on May 7th. Owing to the small size of the planet it will not be possible to view the transit without the aid of a telescope. But even the smallest telescope will show the planet on the sun's disk. In the United States the sun will set with Mercury on its face, the transit beginning about 4:45 P. M. in New York, about 3:45 in Chicago and about 1:45 in San Francisco. It will take a little under eight hours for the planet to traverse the sun's disk and the entire transit will be visible in Alaska, the mid-Pacific and the Philippines. Transits of Mercury are comparatively rare phenomena. The last occurred in November, 1914, and the next will occur in November, 1927.

Motometer Security


A PROTECTION FOR THE RADIATOR CAP WHICH CAN BE PROVIDED AT SLIGHT EXPENSE
RIVETED INTO RADIATOR CAP
LENGTH OF BRASS PIPE TO BE INSERTED END-WISE INTO RADIATOR
SHORT LENGTH OF BRASS PLUMBING CHAIN
LOOSE EYE BOLT RIVETED TO SECURE TO PIPE

Simple way to rig up chain and toggle to guard motometer from ordinary theft. —G. A. Luers.

EARLE E. LIEDERMAN as he is today

The Muscle Builder

Show me the man who doesn't want muscle, with abounding health, and I'll show you a man who is ready to be measured for a wooden box—he's dead and he doesn't know it. A body without muscle is like a house without foundation—a little storm, and over it [illegible].

Get wise, fellows, I shouldn't have to tell you these things. You can't enjoy life with a weak, sickly body. There is no pleasure like the feeling of health and strength. And when I say strength, I don't mean any half way business. Do it right, or forget it.

THE WHOLE WORKS

I build muscle—good, big, solid muscle. Let other fellows knock this idea if they want. I know what I'm doing and I guarantee you'll like it. I'll put an arm on you that can be made pliable one second and bulge out hard as steel the next. An arm that will be equally useful in weight lifting and any kind of skillful athletics. Just for a starter, I'll increase the size of that arm at least one full inch in the first 30 days. I'll put a chest on you to be proud of. A full, deep chest with a pair of lungs that will take a man sized load of rich oxygen with every breath, and you know what that means. Your lungs feed your blood, shooting a kick through your veins that will make you just bubble over with vitality. I will build up those inner muscles around your heart and every vital organ. I will send a thrill up your old spinal column that will make you feel like tackling a wild cat.

A NEW BODY IN 90 DAYS

Some wise crackers say it takes years to put a man in shape. That's because they don't know any better. I want just 90 days and I'll change your body so you won't recognize yourself. By that time every muscle in your anatomy will literally bulge out. And what's more, your whole being will just tingle with excitement. You will have a spring to your step and a flash to your eye that will radiate personality wherever you go. You will feel like shouting, "I'm a man—and I can prove it."

Come on now, fellows. Why waste more time? I'm not just promising these things. I guarantee them. If you doubt me, make me prove it. Are you ready? Let's go.

Send for my new 64-page book
"MUSCULAR DEVELOPMENT"
It is Free

It contains forty-three full-page photographs of myself and some of the many prize-winning pupils I have trained. Some of these came to me as pitiful weaklings, imploring me to help them. Look them over now and you will marvel at their present physiques. This book will prove an impetus and a real inspiration to you. It will thrill you through and through. All I ask is 10 cents to cover the cost of wrapping and mailing and it is yours to keep. This will not obligate you at all, but for the sake of your future health and happiness, do not put it off. Send today—right now, before you turn this page.

EARLE E. LIEDERMAN
Dept. 205. 305 Broadway, New York City

EARLE E. LIEDERMAN,
Dept. 205, 305 Broadway, New York City

Dear Sir: I enclose herewith 10c for which you are to send me, without obligation on my part whatever, a copy of your latest book "Muscular Development."

Name .....
Street .....
City ..... State .....
(Please write or print plainly)

Digitized by Google Original from UNIVERSITY OF CHICAGO

Opportunity Ad-lets

YOU will find many remarkable opportunities and real bargains in these columns. It will pay you to read and investigate the offerings made every month by reliable firms, dealers and amateurs from all over the country. No matter what you may be seeking, whether supplies, automobile accessories, the opportunity to make money, or anything else, you will find listed here the best and most attractive specials of the month.

Advertisements in this section twelve cents a word for each insertion. Name and address must be included at the above rate. Cash should accompany all classified advertisements unless placed by an accredited advertising agency. No advertisement for less than 10 words accepted.

Ten per cent. discount for 6 issues, 20 per cent. discount for 12 issues. Objectionable or misleading advertisements not accepted. Advertisements for the July issue must reach us not later than May 15th.

The Circulation of Science and Invention is over 177,000 and climbing every month

EXPERIMENTER PUBLISHING CO., INC., 53 Park Place, New York City, N. Y.

Agents Wanted

Agents—Best seller; Jem Rubber Repair for tires and tubes; supersedes vulcanization at a saving of over 800 per cent; put it on cold. It vulcanizes itself in two minutes and is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Dept. 601, Philadelphia, Pa.

Big money and fast sales. Every owner buys gold initials for his auto. You charge $1.50; make $1.35. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 71, East Orange, N. J.

Auto Owners! Get your tires Free! Be our Factory Agent! Big spare time money-maker! Sample tires furnished. No capital or experience needed. Write today. Armour Tire & Rubber Co., Desk 679, Dayton, Ohio.

$10 daily silvering mirrors, plating and refinishing lamps, reflectors, autos, beds, chandeliers by new method. Outfits furnished. Write Gunmetal Co., Ave. D, Decatur, Ill.

Agents Wanted Full or Part Time to Sell on liberal commission new Thermostatic Automatic Carburetor control Attachment for Ford cars. Increases mileage 100 per cent. No holes to drill. Attached in 2 minutes. Does automatically exactly what Ford Manual instructs driver do by hand. Cadillac now using Thermostatic Carburetor Control under Blancke license. Write at once. A. C. Blancke & Co., Dept. 8C, 602 W Lake St., Chicago.

Agents—I am paying $2 an hour taking orders for complete new line of household necessities. Write quick for particulars. Albert Mills, General Manager, 1330 American Bldg., Cincinnati, O.

We start you without a dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept. 232, St. Louis.

Make $25 to $50 week representing Clows' Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clows Company, Desk 27, Philadelphia, Pa.

Sell Like Blazes! New, Instant Stain Remover. Fine Premium every sale. Big profits. Outfit free. Write quick. Christy, 35 Union, Newark, New York.

Use our Handsome Catalog; get orders from every home for Dr. Blair's famous home products. Liberal pay. Dr. Blair Laboratories, Dept. 535, Lynchburg, Va.

Only one sale a day means $200 per month. Five sales, $1,000 per month. Marvelous new adding machine. Retails $15. Work equals $350 machine. Adds, subtracts, multiplies, divides automatically. Speedy, accurate, durable, handsome. Five-year guarantee. Offices, stores, factories, garages, buy one to dozen. A fortune for live agents. Write quick for protected territory and free trial offer. Lightning Calculator Co., Dept. W., Grand Rapids, Mich.

Earn big money fast applying gold initials to autos. Every owner buys—$1.35 profit on $1.50 sale—particulars and samples free. Write quick. Lithogram Co., Dept. 19, East Orange, N. J.

Write and learn how to start profitable business without capital or experience. Silvering mirrors, refinishing auto headlights, tableware, plating. Outfit furnished. International Laboratories, Dept. 25, 309 Fifth Ave., New York.

Agents—Our soap and toilet article plan is a wonder; get our free sample case offer. Ho-Ro-Co., 2719 Dodier, St. Louis.

We want Salesmen and Agents, either whole or side line, to sell our low priced radio books to the trade. Excellent proposition for live wires. The E. I. Company, Publishers, 233 Fulton Street, New York City.

New Wonderful Seller. Over 100 per cent profit on every sale of Harper's Ten-Use Set. Needed in every home. Washes and dries windows, sweeps, scrubs, mops, etc. Greatest year 'round seller. Write Harper Brush Works, 152—2nd St., Fairfield, Iowa.

Wonderful invention eliminates all needles for Phonographs. New, different, lasts for years. Preserves records. 12,000,000 prospects. $15 to $30 daily, easy. Carry days supply in pocket. Everplay, Desk 7E, McClurg Bldg., Chicago.

Earn $10 daily silvering mirrors, plating and refinishing metalware, chandeliers, bedsteads, headlights. Outfits furnished. N. Decie Laboratories, 1133 Broadway, New York.

Attention—Agents! Big Money-Making proposition. Mozart Felt Rug, guaranteed made of entirely new felt. Rapid seller. 100% Profit. Sample prepaid $1.75. Write today for full particulars. Maisley-Payne Mfg. Co., 20 S. Sudbury St., Boston, Mass.

$60—$200 a week. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 441 B, North Clark, Chicago.

Agents—Big returns, fast office seller; particulars and samples free. One Dip Pen Co., 12 Daily Record Bldg., Baltimore, Md.

Make $120 Weekly in Spare Time—Sell what the public wants—long distance radio receiving sets. Two sales weekly pays $120 profits. No big investment, no canvassing. Sharpe of Colorado made $955 in one month. Representatives wanted at once. This plan is sweeping the country—write today giving name of your county. Ozarks, 835 Washington Blvd., Chicago.

A business of your own. Make Sparkling Glass Name and Number Plates. Medallions, Checkerboards, Signs. Big illustrated book free. E. Palmer, 518, Wooster, O.

Agents Wanted (Cont'd)

Street demonstrators. Intensifiers; sample free. Magneto Recharger, $55.00; terms: Magneto Speed Tester, $8; Nonspeed tester, $3; Adjustable Gasoline Sign, $5; distributors wanted. Reliable Mfg. Co., Utica, N. Y.

Formulas, Processes, Trade-Secrets—Different, dependable, profitable; catalog free. D. Thaxly Co., Washington, D. C.

Rummage Sales make $50.00 daily. We start you. Representatives wanted everywhere. Wholesale Distributers, Dept. 32, 609 Division Street, Chicago.

Agents Coining Money Applying Monograms on automobiles; you charge $1.50, profit $1.40; $15 daily easy; experience unnecessary; free samples. Worcester Monogram Co., Worcester, Mass.

American Made Toys

Manufacturers on large scale, also homeworkers, wanted to manufacture Metal Toys and Novelties, Barking Dogs, Wag-Tail Pups, Wild Animals, Automobiles, Indians, Cowboys, Baseball Players, Cannons, Toy Soldiers, Crowing Roosters, Statues of Liberty, Miniature castings of Capitol, Bathing Girl Souvenirs and others. Unlimited possibilities. Guaranteed casting forms furnished manufacturers from $5.00 up, with complete outfit. No experience or machinery necessary. Hundreds made complete per hour. We buy goods all year and pay high prices for finished goods. Cash on Delivery. Contract orders placed with manufacturers. Enormous business waiting to be taken care of in 1924. Catalog and information free. Correspondence invited only if you mean business. Metal Cast Products Co., 1696 Boston Rd., New York. Established since 1912.

Automobiles

Build a Real Automobile—Weight 150 pounds. Handy men or boys build at small cost. Complete Book Easy-to-Follow Plans, 25c. Famous 2½ H. P. Shaw Motor supplies power; also sold complete. Stamp brings descriptive circular. Shaw Manufacturing Company, Dept. SI-2, Galesburg, Kansas.

Battle Photos and War Relics

For Sale: Relics Collected from Europe's Battlefields. Firearms, medals, helmets, etc. Illustrated catalogue and sample War photographs 25c. Lieut. Welch, 2117 Regent Place, Brooklyn, N. Y.

Books

Perpetual Motion, by Percy Verance. A history of the efforts to discover same from earliest days to the present, together with a scientific discussion regarding the possibility of its ultimate achievement. Profusely illustrated. 357 pages. Price postpaid, $2.00. The Enlightenment Specialty Co., 305 Fourth St., Edwardsville, Ill.

Free—Upon request will send you my literature illustrating the following books. Astrology, Character, Clairvoyance, Concentration, Healing, Hypnotism, Magnetism, Mediumship, Personal Magnetism, Personality, Physiognomy, Salesmanship, Seership, Success, Sex, Will, Yogi Philosophy, Gazing Crystals, etc. A. W. Martens, E. E. 6, Burlington, Iowa.

Success "Master Key." Power of Will. Coue's all, $5.00. 900 pages. Phipps, 1014 Belmont, Chicago.

Diseases and Their Innate Healer. Book 50 cents. Arthur Stevens, Wauseon, O.

Hypnotism Astounds, Controls. Wants gratified. 25 easy Lessons $2.75. "Mindreading" (Any distance) Wonderful. Genuine. Guaranteed $2.75. "Book of Wonders, Mysteries and Disclosures" $20.00 worth for $2.00. All three $5.00. Catalogs free. Science Institute, SV 1014 Belmont, Chicago.

Sleep Quickly Produced. Self or others. Infallible. Priceless. Guaranteed $1.10. "How to Live Right" 10c. "Way to Win" 10c. Prof. Deprado, SV357 Oak, Chicago.

"Nature's Finer Forces"—1923 includes Lights, Colors, Tones, Vibrations, Auras, Odics, Electro-Magnetons, Cold-lights, Radio, Marvelous Discoveries 260 pages. Satisfaction guaranteed. Table contents Free. Stevens Research Laboratories, 242 Powell, San Francisco, Calif.

Business Opportunities

Earn $10 to $20 per day. Learn sign painting, auto painting, decorating, paperhanging. Be an expert in a few weeks; low cost; actual work; no books. Catalog Free. Chicago Painting School, 132 West Austin Avenue, Chicago.

Inch Display, 100 magazines, thrice $8. Beck, 5453 Alaska, St. Louis.

Bookkeeping in a Week. $1 postpaid. Dukes, 1857 Walton Ave., New York.

If you have adaptability to selling specialties, exclusive territory is available on the Hush-A-Phone. This device is generally recognized by the largest concerns in the country, as superior to a phone booth for voice privacy, office quiet, and telephoning in noisy places. Over a thousand banks have adopted it. It is without competition. Energetic men can make a life occupation of selling the Hush-A-Phone in their section. Office appliance, and telephone men particularly adapted. Write for proposition. Hush-A-Phone Corp., Room 1311, 19 Madison Avenue, New York City.

Don't buy a business. Start one yourself. Little capital necessary. Information. Paul Kaye, 149 Broadway, N. Y. Dept. X.

Business Opportunities (Cont'd)

Stop Plodding! Be Successful. Operate a Tire Repair Shop. Make big profits in any locality. We teach you and furnish complete equipments $100 up. Book of Opportunity free. Haywood's 1312 South Oakley Avenue, Chicago.

Dollars yearly in your backyard. No mushroom dope. Particulars free. Mels, 313 East 89th, New York.

Free, $5 Book. How to become Successful in Real Estate and Insurance. Particulars. Macdonald Cooperative Realty, San Diego, Calif

Free Instructive Book. Start your own little Mail Order Business. Home employment evenings. Also secure agents to sell for you. We tell you how. Also furnish beginner's Outfit circulars, samples, specialties. Book sent free. Pier, 754 Cortlandt Street, New York.

You can have a business-profession of your own and earn big income in service fees. A new system of foot correction; readily learned by anyone at home in a few weeks. Easy terms for training, openings everywhere with all the trade you can attend to. No capital required or goods to buy, no agency or soliciting. Address Stephenson Laboratory, 18 Back Bay, Boston, Mass.

Sell us your spare time. Write showcards for us. We instruct and supply work. No experience necessary. Wilson Methods, Limited, Dept. 51-C, Toronto, Canada.

Chemistry

Learn Chemistry at Home. Dr. T. O'Conor Sloane, noted educator and scientific authority, will teach you. Our home study correspondence course fits you to take a position as chemist. See our ad on page 81 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

J. O. Nesser, Analytical and Consulting Chemist. 10230 Oakland Blvd., Detroit, Mich.

Experimenters—We carry a complete supply of chemicals and glassware for your chemical laboratory. Catalogue, 5c. National Scientific Supply Co., 241 Pennsylvania Ave., Washington, D. C.

Experimental Chemicals and Apparatus. Price list, 5c. George Ott, 1218 Chestnut St., Reading, Pa.

Technical Information, analysis, formulas, trade secrets; consultation, $1. Jacob Sluyter, Chemist, 2523 East St., Davenport, Iowa.

Experimenters! Quarter brings three copies "Popular Chemistry" magazine. Wright Laboratory, Dept. A, Caldwell, New Jersey.

Correspondence Courses

Used correspondence courses bought and sold. Bargain catalogue 1,000 courses free. Students' Exchange, Dept. 4, 47 West 42d St., New York.

Used correspondence courses of all schools sold, rented and exchanged. New 1924 catalogue free. (Courses bought). Lee Mountain, Pisgah, Alabama.

Duplicating Devices

"Modern" Duplicators save Time, Labor and Money. Gets Business. Reproduces Typewritten or penned letters, Drawings, Lessons, Music, Menus, Bids, Notices, Specifications, Maps or anything in one or more colors. Prints two per minute. Special Sale On. 30 Days' Free Trial. $2.25 up. Booklet Free. B. J. Durkin-Reeves Co., Pittsburgh, Pa.

For Advertisers

24 words—355 Rural Weeklies $14.20. Ad-Meyer, 4112 SI, Hartford, St. Louis, Mo.

For Inventors

If you have a practical, useful invention to sell, write us promptly, stating whether patented. American Patents Corporation, Barrister Building, Washington, D. C.

We Develop your ideas into commercial shape for presentation to purchasers, making working models, drawings, experiments or tests. Courtesy, efficiency, secrecy and ample equipment; 30 years' experience. Ducorron-Rich Engineering Co., 504 Pacific Mutual Bldg., Los Angeles, Cal.

Inventors—We develop your invention to practical use; make necessary drawings, models; expert engineering counsel; before or after patent; also help market your invention. Investigate. (No attorneys or brokers.) Caston-Guay Engineers, Washington, D. C.

Patent Engineer De Lemos, 296 Broadway, New York. Patents, all countries, reasonable rates, terms, get booklet "How Do I Sell My Patent?"

Unpatented Ideas Can Be Sold. I tell you how and help you make the sale. Free particulars (Copyrighted 1923). Write W. T. Greene, 808 Jenifer Bldg., Washington, D. C.

Your Chemical problem solved and working process furnished for Five Dollars. Write me. W. Stedman Richards, Consulting Chemist, Box 2402, Boston, Mass.

Formulas

Moneymaking Books, Plans, Formulas. Catalogue Free. Ideal Book Shop, 5501-E, North Robey, Chicago.

Formulas—For transfering pictures from newspapers; making twenty different inks, including Gold, Silver and Duplicating; also for Duplicator. All 25c, postpaid. Ideal Supply Co., Chandlerville, Ohio.

Digitized by Google UNIVERSITY OF CHICAGO

For the Photographer

Have you a Camera? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 118 Camera House, Boston, 17, Mass.

Games and Entertainment

Tricks, Puzzles, Jokes, Magical Apparatus, Plays, Stage Supplies. Mind-Reading Acts and Sensational Escapes. Send 10c for 160-page illustrated 1922 professional catalogue. Oaks Magical Co., Dept. 549, Oshkosh, Wis.

Health

Free to Men—Information of a scientific nature that has brought physical vigor and happiness to thousands. No charge; no obligation. Enclose stamp for reply. C. I. Wood & Co., Colorado Springs, Colorado.

Free—Stop using tobacco. We will give free information how to conquer habit easily and permanently. Results guaranteed. Anti-Tobacco League, Box M, Omaha, Neb.

Help Wanted

We want Salesmen and Agents, either whole or side line to sell our low priced radio books to the trade. Excellent proposition for live wires. The E. I. Company, Publishers, 233 Fulton Street, New York City.

Detectives Needed Everywhere. Work home or travel. Experience unnecessary. Write, George Wagner, former Government Detective, 1968 Broadway, N. Y.

Silvering Mirrors, French plate. Easily learned, immense profits. Plans free. Wear Mirror Works, Excelsior Springs, Mo.

Employment in South America. Classified Lists of Employers $1. South America Information Bureau, Portland, Oregon.

Earn $25 Weekly, spare time, writing for newspapers, magazines. Experience unnecessary; details free. Press Syndicate, 986 St. Louis, Mo.

All men, women, boys, girls, 17 to 65, willing to accept Government positions, $117-$250, traveling or stationary, write Mr. Ozment, 293 St. Louis, Mo., immediately.

Be a Detective; Excellent opportunity; good pay; travel. Write C. T. Ludwig, 1417 Westover Bldg., Kansas City, Mo.

Men, Women, 18 up, Wanted—Get steady work. Sure pay. $133 to $250 month. Quick raise; pleasant work; no layoffs; vacation with pay. U. S. Government life positions. For list of positions write immediately—today sure. Franklin Institute, Dept. J-24, Rochester, N. Y.

Firemen, Brakemen, Baggagemen, Sleeping car, train porters (colored). $140-$200. Experience unnecessary. 897 Railway Bureau, East St. Louis, Ill.

Railway Postal Clerks—Start $133 month. Railroad pass; expenses paid; questions free. Columbus Institute, H-4, Columbus, Ohio.

Detectives Earn Big Money. Travel. Excellent opportunity. Great demand everywhere. Experience unnecessary. Particulars free. Write, American Detective System, 1974 Broadway, N. Y.

Wanted at Once—Young Men to learn Automobile Repair Business. I teach you at home by my practical low-priced method. Opportunity for every man wishing to earn $150 to $400 per month. Write Wm. H. Arhelger, Dept. 1101, c/o Garage, 555 Downer Ave., Milwaukee, Wis.

Clerks for Government Postal and other good positions, $1,400-$2,300 yearly. Experience unnecessary. Full particulars free, by writing G. W. Robbins, Civil Service Expert, 764 Burchell Bldg., Washington, D. C.

Improved Made Toys

Wanted Manufacturers and Housewerkers to manufacture Metal Toys and Novelties. Wonderful opportunity. Millions needed. In Whistling Birds, Wild Animals, Wag Tail Pups, Crowing Roosters, Automobiles, Baseball Players, Statues of Liberty, Indians, Toy Soldiers, Barking Dogs; and 50 others. No experience or tools necessary. Guaranteed casting forms with complete outfit, at cost. From $3.50 up. We buy goods all year. Cash on delivery. Higher price for finished goods. Contract orders placed. Send for catalog and information free. The Improved Metal Casting Co., 342 East 145 St., New York.

Instruction

Learn Chemistry at Home. Dr. T. O'Conor Sloane, noted educator and scientific authority, will teach you. Our home study correspondence course fits you to take a position as chemist. See our ad on page 81 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

Correspondence Courses sold complete; one-third usual prices because slightly used; easy terms; money back guarantee. All schools and subjects. Write for special Free Catalog. Courses bought for cash. Economy Educator Service, H202, West 49th St., New York.

Machinery and Tools

Special Machine Builders, tool and die makers, inventors' models, production work of all kinds. Dept. R, Quality Hardware & Machine Co., E. Ravenswood & Thorndale Avenues, Chicago, Illinois.

Concrete Building Block Machines and Molds. Catalogue free. Concrete Machine Co., 305 South Third St., St. Louis, Mo.

Manufacturing

To order: Metal articles, simple, or complicated machinery. Models, tools, patterns. Experimenting. Parma Engineering Works, Brooklyn Station, Cleveland, O.

Miscellaneous

Electrical and Chemistry Outfits. Fractional H. P. and Toy Motors. Wagner Grinder and Buffer for the home mechanic, garages and repair shops. Literature free. Prices reasonable. A. Urie, 333a W. Manhattan Blvd., Toledo, Ohio.

How? How Much? What? Where? Why? When? Who? Have you a question of any kind which needs answering? Some of us can probably answer it no matter what it is. Send us One Dollar. You will get your Dollar back or a satisfactory answer promptly. Technical Associates, Dept. D, P.O. Box 1478, Boston, Mass.

Paint Attractive Signs and Showcards with letter patterns. Samples for stamp. John Fohn, P2433 Greenview Ave., Chicago.

Miscellaneous (Cont'd)

Make Money! Sell Pop Corn. Make into balls, cakes or crystallized. Delicious confectionery. Easy to make. Formula, $1.00 Arthur A. Lutz, York, Pa.

Razor Blades Resharpened. Roseto Hanery, Roseto, Pa. Cheapest, best work.

Developing ideas and manufacturing our specialty. Absolute satisfaction, 33 years' experience, write us. The Eagle Way & Stop Signal Co., 2016 Elm St., Cincinnati, Ohio, Dept. A.

Electricians and Winders—20 blue prints of A.C. motor windings, single, two, three phase, $1.00; 90 blue prints, $2.40. These blue prints make winding easy. E. & E. Company, South Bend, Indiana.

Healthy, Intelligent, Registered Mammoth, Great Danes for sale. Box 23, New Richmond, Ind.

Draftsmen, Machinists—Shop and office kinks. Loose-leaf. Sample sheets, 25c (Refunded). George Bollman, 446 Elizabeth Street, Hazelwood, Pittsburgh, Pa.

Hindu Psychology, Yogi, Personal Magnetism. The Secret Sciences, Books and Courses. Large illustrated Private Catalogue, with "How Realize Any Desire," 25c. Adaros, 116 South Michigan, Chicago.

Health, Wealth, Love, Happiness. You can have them all. Inquire Apt. 2, 5641 Sherbrooke St., West, Montreal, Canada.

I write letters, folders, booklets, complete follow-up for manufacturers, mail-order dealers. Long experience. Write for details. L. Taylor, Box F44, Freeport, Ill.

Models and Model Supplies

The Medelmaker. For those interested in making working models. Send 10 cents. Address P. E., 120 Liberty Street, New York.

Motorcycles—Bicycles

Build a Real Automobile—Weight 150 pounds. Handy men or boys build at small cost. Complete book Easy-to-Follow Plans, 25c. Famous 2½ H.P. Shaw Motor supplies power; also sold complete. Stamp brings descriptive circular. Shaw Manufacturing Company, Dept. SI-2, Galesburg, Kansas.

Music

Cornetists, Trombonists, Saxophonists, Clarinetists—Get "Free Pointers." Name instrument. Virtuosa Music School, Concord, Mass.

Novelties

Magic Goods, cards, books, novelties, tricks. Catalogue free. Clifford Fenner, 2401 Jefferson, Louisville, Ky.

Patent Attorneys

The Patenteme Is Free. A liberal education in patents. Anderson & Son, attorneys, estab. 1865, 637 F St., N. W. Washington, D. C

Patents. Prompt, personal service. Twenty years' experience. Write for booklet. Reasonable charges. C. E. Trainor, 808 H Northwest, Washington, D. C.

Patents. Send for free booklet. Highest references. Best results. Promptness assured. Send model or drawing for examination and opinion. Watson E. Coleman, Patent Attorney, 644 G Street, Washington, D. C.

Get your own patents. Application blanks, complete instructions $1. Cutting Bros., Campbell, Calif.

Inventers write me about patents. My fees payable monthly. Booklet free. Frank Fuller, Washington, D. C.

Unpatented Ideas Can Be Sold. I tell you how and help you make the sale. Free particulars (Copyrighted 1923). Write W. T. Greene, 809 Jenifer Bldg., Washington, D. C.

Patents Procured, Trade-Marks Registered—A comprehensive, experienced, prompt service for the protection and development of your ideas. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request. Richard B. Owen, 130 Owen Bldg., Washington, D. C., or 2278-T Woolworth Bldg., New York.

Patents Procured. Send sketch or model today for examination, prompt report and advice. No charge for preliminary advice. Write for free booklet and blank form on which to disclose your idea. Highest references. Promptness assured. Clarence A. O'Brien, Registered Patent Lawyer, 922 Security Bank Building, Directly across the street from Patent Office, Washington, D. C. (See page 83.)

Patents—Let me assist you in obtaining your Valid Patent Rights. Personal service. Promptness assured. George Van Den Berg, Barrister Bldg., Washington, D. C.

Monroe Miller, Ouray Bldg., Washington, D. C. Patent Attorney; Mechanical, Electrical Expert. Free Blue Book gives candid advice.

"Inventor's Advisor," the valuable Patentbook with 139 mechanical movements and illustrations, sent free upon request. M. I. Labiner, Patent Attorney, 3 Park Row, New York.

Lacey Patent-Sense. "The book the inventor keeps." Free. See page 80.

"Inventors' Guide" free on request; gives valuable information and advice for all who have original ideas or improvements. Frank Ledermann, Registered Attorney and Engineer, 15-E Park Row, New York.

Inventors—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee schedule, information Free. Lancaster and Allwine, 242 Ouray Bldg., Washington, D. C.

Herbert Jenner, Patent Attorney and Mechanical Expert, 624 F Street, Washington, D. C. I report if patent obtainable and exact cost. Send for circular.

M. P. Laughlin, Patents. Engineer-Attorney, 48 East 41st Street, New York

Patents

Patent applications filed with drawing, $20; deferred, $15; strongest claims; foreign patents low. Inventors' Service, 11 Broadway, New York.

M. P. Laughlin, Patents. Engineer-Attorney, 48 East 41st Street, New York.

Patents for Sale

Brush's Pad, No. 1,224,581 for $16,000.00. C. B. Twyford, 617 Bailey St., Zanesville, Ohio.

Personal

Lonesome? Make new friends. Write Dolly Gray Club, Box 186K, Denver, Colorado. Stamp appreciated.

Exchange Cheery Letters with new friends. Write Betty Lee Inc., 4254 Broadway, New York City. Stamp appreciated.

Exchange jolly letters with new friends. Lots fun! Send stamp. Eva Moore, Box 908, Jacksonville, Fla.

Correspondence Club—Many wealthy members everywhere. Fascinating particulars free. Smith, Box 1167Y, Denver, Colo.

Lonely Hearts, join our Club, be happy, correspondence everywhere, many wealthy, descriptions, photos free; either sex, most successful method, 23 years' experience. Standard Corr. Club, Grayslake, Ill.

Phonographic Supplies

Build Your Phonograph. Quality phonoparts. **Famous Serenado Motors.** Also original Perfection Motors. Electric Motors, tonearms, reproducers, amplifiers, case material, accessories. Free blueprints and building instructions. Big saving. Wonderful results. Prompt delivery. Catalogue mailed for ten cents. Hoosier Mfg. & Supply Company, 321 Baldwin Block, Indianapolis, Indiana.

Photoplays, Stories, Etc.

Big money writing photoplays, stories, poems, song. Send for free copy America's greatest magazine for writers. Tells you how to write and sell. Writer's Digest, 637 Butler Bldg., Cincinnati, Ohio.

$ $ $ For Ideas. Photoplay Plots Accepted any form; revised, criticised, copyrighted, marketed. Advice free. Universal Scenario Corporation, 223 Security Bldg., Santa Monica & Western, Hollywood, California.

Postcards and Pictures

Join Live Postcard Club. Interesting, fascinating. Big Magazine, prospectus, 10c. "Universalist," 1035 West 18th St., Chicago, Ill.

Printing

Printing—100 letter heads, 100 envelopes, 100 cards, all for $3.00. A. Carvajal, 231 Simpson St., San Antonio, Tex.

500 letterheads, envelopes or cards, $2.25. John Grella, 5925 South Washtenau, Chicago.

Radio

Attention! 50 Vacuum Tube Hook-Ups. The greatest collection of Vacuum Tube Circuits ever brought under two covers at such insignificant cost. These diagrams will be found in the great "Rasco" catalogue which contains raw materials and parts in a greater profusion than any other catalogue. 15c in stamps or coin will bring the catalogue to you. Radio Specialty Company, 100 Park Place, New York City.

Boys, don't overlook this! The "Rasco" Baby Detector. Greatest detector ever brought out with molded base. Fully adjustable. See former advertisements in this publication or our catalogue. Detector with Galena Crystal complete, 50c; the same Detector with Radiocite Crystal, 75c, prepaid. Send for yours today. Radio Specialty Co., 100 Park Place, New York City.

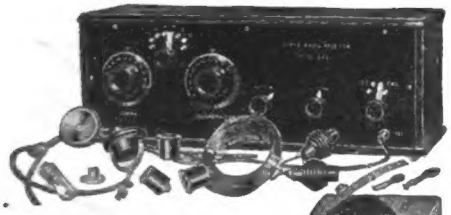
Radio Generators—500 Volt 100 Watt $28.50 each. Battery Chargers $12.50—High Speed Motors, Motor-Generator Sets all sizes. Motor Specialties Co., Crafton, Pa.

Motors—G. E. ¼ HP. $15.00—½ HP. $32.50—1 HP. $62.50. Generators 8 volt 10 amp $15. 32 volt 500 watt $30. Other sizes. Low prices. Motor Specialties Co., Crafton, Pa.

Hear 2,000 miles on a one-tube set. Distance, selectivity, volume. Direct from manufacturer to you. Regular value, $18.75; our price, $6.90. W. Greene, 27 Third Ave., New York City.

The How and Why of Radio Apparatus, by H. W. Secor, E. E. This newest book on radio matters fulfills a distinct gap in wireless literature in that, while the treatment is made as understandable and as free from mathematics as possible, it at the same time incorporates a wealth of technique and instruction for the Radio Amateur—the Radio Operator—the Installation and Designing Expert—as well as teachers and students of the subject in general. A very broad field has been covered by the author, at the same time giving a great deal of information not found in other text books. If you are engaged in any branch of the Radio or allied arts at all you will surely need this latest contribution to radio literature, which is destined to be found on every radio man's book shelf before long. A glance at the following list of chapters gives but a very scant idea of the extensive and useful radio knowledge provided in its text. The Induction Coil; The Alternating Current Transformer; Radio Transmitting Condensers; The Spark Gaps; Radio-Transmitting Inductances; Radio Receiving Tuners; Radio Receiving Condensers; Detectors; Telephone Receivers; Radio Amplifiers; Construction of a Direct Reading Wavemeter and Decremeter; Antenna Construction; The Calculation and Measurement of Inductances; Appendix containing very useful tables, covering all subjects treated in this very unusual book. This newest of Radio Works, cloth bound in Vellum de Luxe, Gold Stamped and Hand Sewed, has 160 pages. Size of book, 6x9 inches. The How and Why of Radio Apparatus. Postpaid, $1.75. Experimenter Publishing Co., Book Dept., 53 Park Place, New York City.

Digitized by Google
Original from UNIVERSITY OF CHICAGO



$5.00 Down

Now Brings You This Famous

TUSKA

(Licensed under Armstrong Regenerative Patents)

3-Tube Receiver with Complete Outfit

Outfit absolutely complete. Positively nothing additional needed. Without a radio set you are missing the greatest thrill of your life. Think of it! All about you the air is filled with wonderful concerts, grand operas, dance music, lectures, etc. But without a set you miss it all.

Easy Monthly Payments!

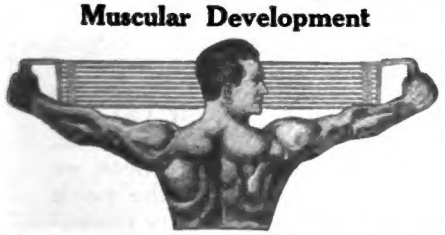
Now you can buy a Standard Set, of known value, with complete outfit and pay as you enjoy it. Every set shipped on basis of satisfaction guaranteed.

Write TODAY

Send at once for our great special offer on this wonderful Tuska Outfit. A postcard brings full details. Number of outfits limited. Don't delay.

BABSON BROS., Dept. 53-35
2843 West 19th Street, Chicago, Ill.

How to Become a Marvel of Muscular Development



You Can Develop Enormous Muscles With This Newest and Greatest Invention in Physical Culture Apparatus

If you want to be a *real* strong man, if you want to build up a powerful, muscular body that will make you stand out among men, you can do it simply by using the McFadden Patented 10 Cable Progressive Exerciser, which can be instantly converted into two 5 cable progressive exercisers. Can be adjusted to give you as much resistance as you want up to 200 pounds.

NEWLY PATENTED STIRRUP

This ingenious device is a new addition to the McFadden 10 Cable Progressive Exerciser and is provided to give you the proper exercise to build up the most powerful legs.

ADJUSTABLE PATENTED HEADGEAR

increases the size of your neck one inch in 30 to 90 days

This apparatus is simplicity itself and with it you can accomplish the most wonderful results. It is adjustable and will fit any man or boy. By using it in connection with my Progressive Exerciser there is no reason why you cannot become just as strong as you want to be.

12 Weeks Home Instruction Course FREE

The introductory price of the whole outfit is only $8, a very small cost for what it includes. If you are not fully satisfied your money will be refunded without quibble or question. Send NOW for this great outfit. Delays do not make strength. Order TODAY.

Michael McFadden Dept. 12, 103 E. 13th St. NEW YORK CITY

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

Relics

Indian lore, exploration, discovery, get them all in Archaeological Research. Six wonderful, illustrated numbers, 25c. Maas Publishers, Schenectady, N. Y.

Salesmen Wanted

A Salesman wanted in every town or city within 25 miles of a broadcasting station to sell Radiogem, the complete radio receiving set that retails for $2.50. With Radiogem there is nothing else to buy—the outfit includes the Radiogem receiving apparatus, 1,000-ohm phone, and aerial outfit. The cheapest radio outfit on the market—yet as practical as the most expensive. Big money to the right men. Send $1.35 for sample outfit. The Radiogem Corp., 66R West Broadway, N. Y. City.

$700.00 Month for Salesmen—Am rounding out 1924 sales force. Proposition is right. No competition. Virgin territory to assign. My men averaged $5,000.00 to $8,000.00 for past year. Buffalo representative averaged $700.00 month. I offer unusual opportunity to salesmen who qualify. Write at once. Address C. R. Coppock, Salesmanager, National Advertising Service, Inc., P. O. Box 66, LaGrange, Ind.

Salesmen—$10 Day, selling new rubberset Broom; cost no more than corn broom. Sample prepaid, $1.25. H. M. Fitzgerald & Co., Box 664, Kane, Pa.

Lightning Strange Battery Compound. Charges discharged batteries instantly. Eliminates old method entirely. Gallon free to agents. Lightning Co., St. Paul, Minn.

Sell Coal in Carload Lots. Side or main line. Experience unnecessary. Earn week's pay in an hour. Liberal drawing account arrangement. Washington Coal Company, 758 Coal Exchange Building, Chicago.

Short Stories, Manuscripts Wanted

Earn $25 Weekly Spare Time writing for newspapers, magazines. Experience unnecessary; details free. Press Syndicate, 987 St. Louis, Mo.

Stories, Poems, Descriptive Articles, Plays, etc., are wanted for publication. Submit Mss. or write Literary Bureau, 165 Hannibal, Mo.

Song Poems Wanted

Write the words for a song. We compose music. Our Chief of Staff wrote many big song-hits. Submit your song-poem to us at once. New York Melody Corp., 412H Romax Bldg., New York.

Poems wanted—Sell your song-verses for cash. Submit Mss. at once or write New Era Music Co., 145, St. Louis, Mo.

Stammering

St-Stu-t-t-tering and Stammering cured at home. Instructive booklet free. Walter McDonnell, 105 Potomac Bank Bldg., Washington, D. C.

Stamps for Collectors

Premier Package contains 25 exceptional stamps cataloguing, $10. Price, $1. Approvals, discounts to 80 percent. Reference. International, 2117 Regent Pl., Brooklyn, N. Y.

Stamps and Coins

California Gold, quarter size, 27c; half-dollar size, 53c. Columbian nickel and catalogue, 10c. Norman Shultz, Box 146. Colorado Spring, Colo.

Stamps 100 All Different 3 cents. S. I. Quaker Stamp Company, Toledo, O.

French Colonies Free—Pretty picture set, Native Chiefs, Tigers, 2c postage. Empire Stamp Company, 354 Lippincott, Toronto, Canada.

Rare Coins—Silver, gold, copper and paper money of the world. Villa Coin New Catalogue, 10c. Alexis Mengelle, Box 387, Colorado Springs, Colo.

Typewriters

All standard makes, $10 up. Fully guaranteed. Free trial. Write for complete illustrated lists, Northwestern Exchange, 320 Goethe St., Chicago.

Typewriters, All Makes.—Save one-half. Thoroughly rebuilt in our factory by the famous "Young Process." Fully guaranteed. Free trial. We handle all standard makes. Cash or sold on easy terms. Write for Catalog. Young Typewriter Co., Dept. 5055, Chicago, Ill.

Ventriloquism

Ventriloquism taught almost anyone at home. Small cost. Send 2c stamp today for particulars and proof. Geo. W. Smith, Room M-864, 125 N. Jefferson Ave., Peoria, Ill.

Wanted

Detectives Earn Big Money. Work home or travel. Experience unnecessary. Particulars free. American Detective System, 1974 Broadway, N. Y.

Deafness

Perfect hearing is now being restored in every condition of deafness or defective hearing from causes such as Catarrhal Deafness, Relaxed or Sunken Drums, Thickened Drums, Roaring and Hissing Sounds, Perforated, Wholly or Partially Destroyed Drums, Discharge from Ears, etc.

Wilson Common-Sense Ear Drums

"Little Wireless Phones for the Ears" require no medicine but effectively replace what is lacking or defective in the natural ear drums. They are simple devices, which the wearer easily fits into the ears where they are invisible. Soft, safe and comfortable. Write *today* for our 168 page FREE book on DEAFNESS, giving you full particulars and testimonials.

WILSON EAR DRUM CO., Incorporated
1024 Inter-Southern Bldg., LOUISVILLE, KY.

PIMPLY SKIN made WELL

When a few applications of this wonder working lotion has cleared faces of ***pimples, blackheads, acne eruptions*** on the face or body, ***enlarged pores, oily or shiny skin,*** you can realize why CLEAR-TONE has been tested and approved in over **100,000 Test Cases.**

The simplicity of the treatment, *The Story of How I Cured Myself* are all explained in my free booklet. Write for your copy today and learn of the results gotten by thousands of men and women.

E. S. GIVENS
168 CHEMICAL BLDG. KANSAS CITY, MO.

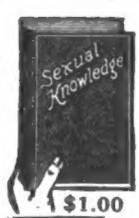
SEX

From "Where Knowledge Means Happiness"
Copyright 1921

Facts other sex books don't dare discuss are plainly told in **"Where Knowledge Means Happiness."** Creates a new kind of married love. One reader says: *It contains more real information than all other sex books put together.*

Sent in plain cover, *by return mail,* for $1.00, cash, money order, check or stamps

Dept. 39 **COUNSEL SERVICE, 257 W. 71 St., N.Y.**



$1.00

Postpaid. Mailed in plain wrapper.

SEXUAL KNOWLEDGE

320 Pages ILLUSTRATED Cloth
By Winfield Scott Hall, M.D., Ph.D.

SEX FACTS MADE PLAIN

What every young man and Every young woman should know
What every young husband and Every young wife should know
What every parent should know

Table contents and commendations on request

AMERICAN PUB. CO., 545 Winston Bldg., Philadelphia

WHY NOT IMPROVE YOUR PERSONAL APPEARANCE?

Send for booklet showing photos of Men with and without the (PERFECT LEG FORMS) for BOW LEGS and KNOCK KNEES. Also BRACES, for children for PERMANENT CURE.

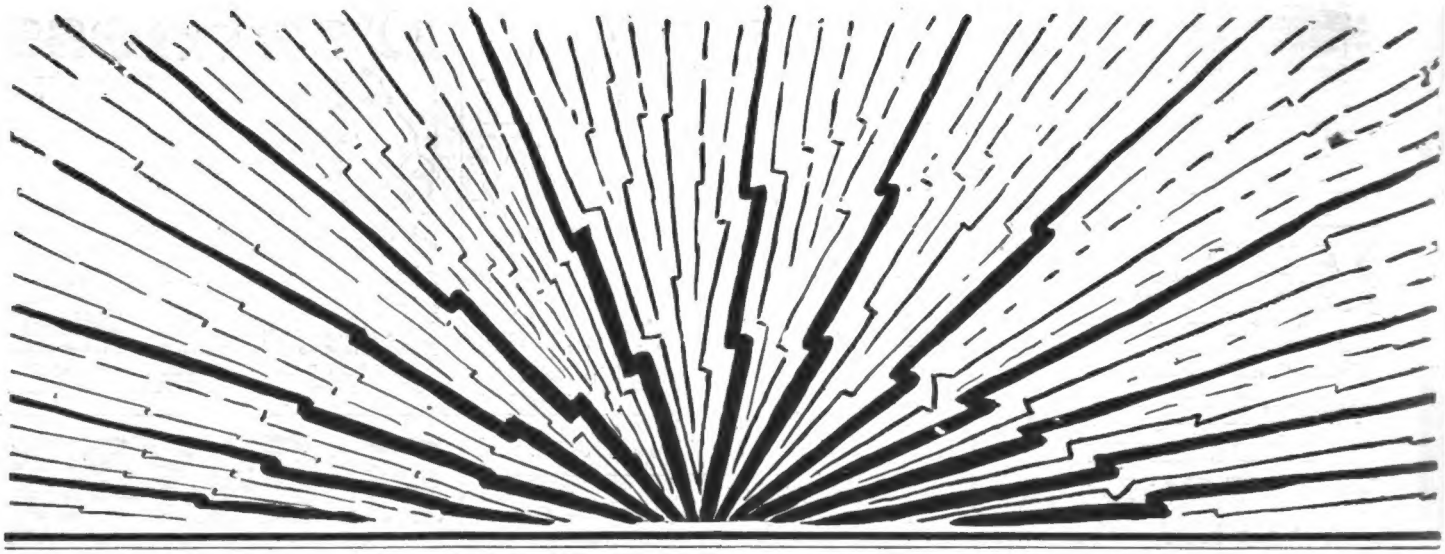
Perfect Sales Co., 140 N. Mayfield Ave., Dept. 50 Chicago, Ill.

ONE THOUSAND AGENTS WANTED

WE want one thousand agents to sell subscriptions to RADIO NEWS, SCIENCE AND INVENTION and PRACTICAL ELECTRICS. We will pay a generous commission for this work and help you in every way. Our three publications are leaders in their fields, ready sellers and this is an offer well worth your while. A few spare hours a day will bring you a handsome return. Write regarding our proposition at once and be the first one to get started in your vicinity.

Experimenter Publishing Co.
HERBERT H. FOSTER, Circulation Manager
53 Park Place New York

Digitized by Google Original from UNIVERSITY OF CHICAGO



To Practical Men and Electrical Students:

Yorke Burgess, founder and head of the famous electrical school bearing his name, has prepared a pocket-size note book especially for the practical man and those who are taking up the study of electricity. It contains drawings and diagrams of electrical machinery and connections, over two hundred formulas for calculations, and problems worked out showing how the formulas are used. This data is taken from his personal note book, which was made while on different kinds of work, and it will be found of value to anyone engaged in the electrical business.

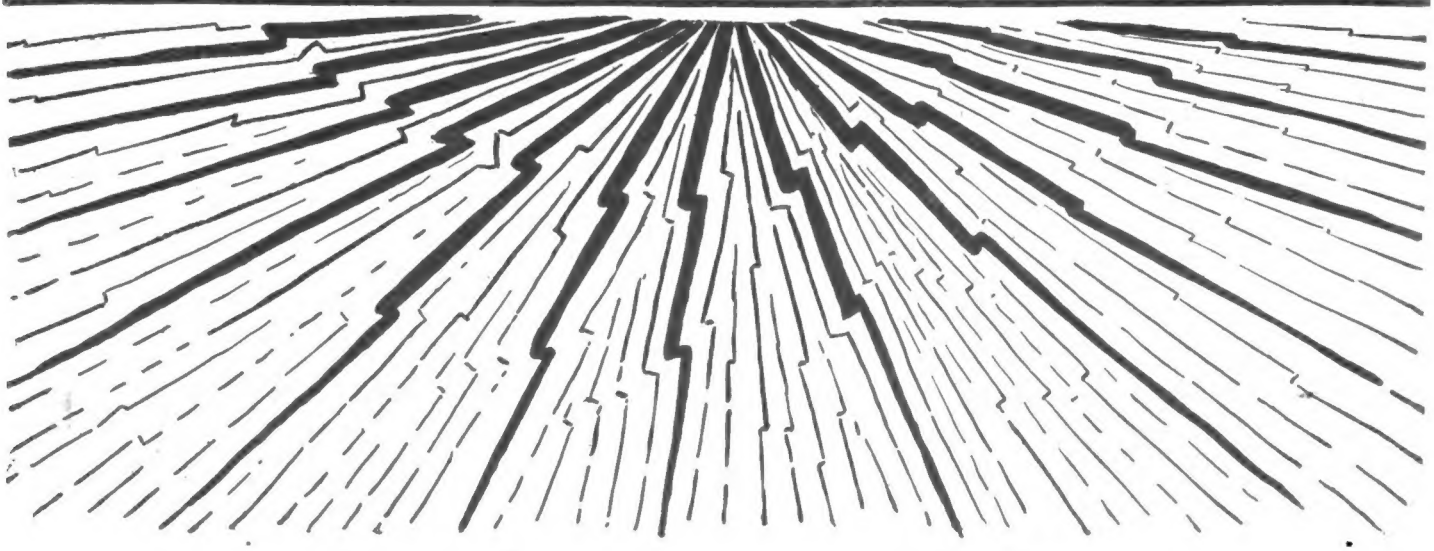
The drawings of connections for electrical apparatus include Motor Starters and Starting Boxes, Overload and Underload Release Boxes, Reversible Types, Elevator Controllers, Tank Controllers, Starters for Printing Press Motors, Automatic Controllers, Variable Field Type, Controllers for Mine Locomotives, Street Car Controllers, Connections for reversing Switches, Motor and Dynamo Rules and Rules for Speed Regulation. Also, Connections for Induction Motors and Starters, Delta and Star Connections and Connections for Auto Transformers, and Transformers for Lighting and Power Purposes. The drawings also show all kinds of lighting circuits, including special controls where Three and Four Way Switches are used.

The work on Calculations consists of Simple Electrical Mathematics, Electrical Units, Electrical Connections, Calculating Unknown Resistances, Calculation of Current in Branches of Parallel Circuits, How to Figure Weight of Wire, Wire Gauge Rules, Ohm's Law, Watt's Law, Information regarding Wire used for Electrical Purposes, Wire Calculations, Wiring Calculations, Illumination Calculations, Shunt Instruments and How to Calculate Resistance of Shunts, Power Calculations, Efficiency Calculations, Measuring Unknown Resistances, Dynamo and Dynamo Troubles, Motors and Motor Troubles, and Calculating Size of Pulleys.

Also Alternating Current Calculations in finding Impedance, Reactance, Inductance, Frequency, Alternations, Speed of Alternators and Motors, Number of Poles in Alternators or Motors, Conductance, Susceptance, Admittance, Angle of Lag and Power Factor, and formulas for use with Line Transformers.

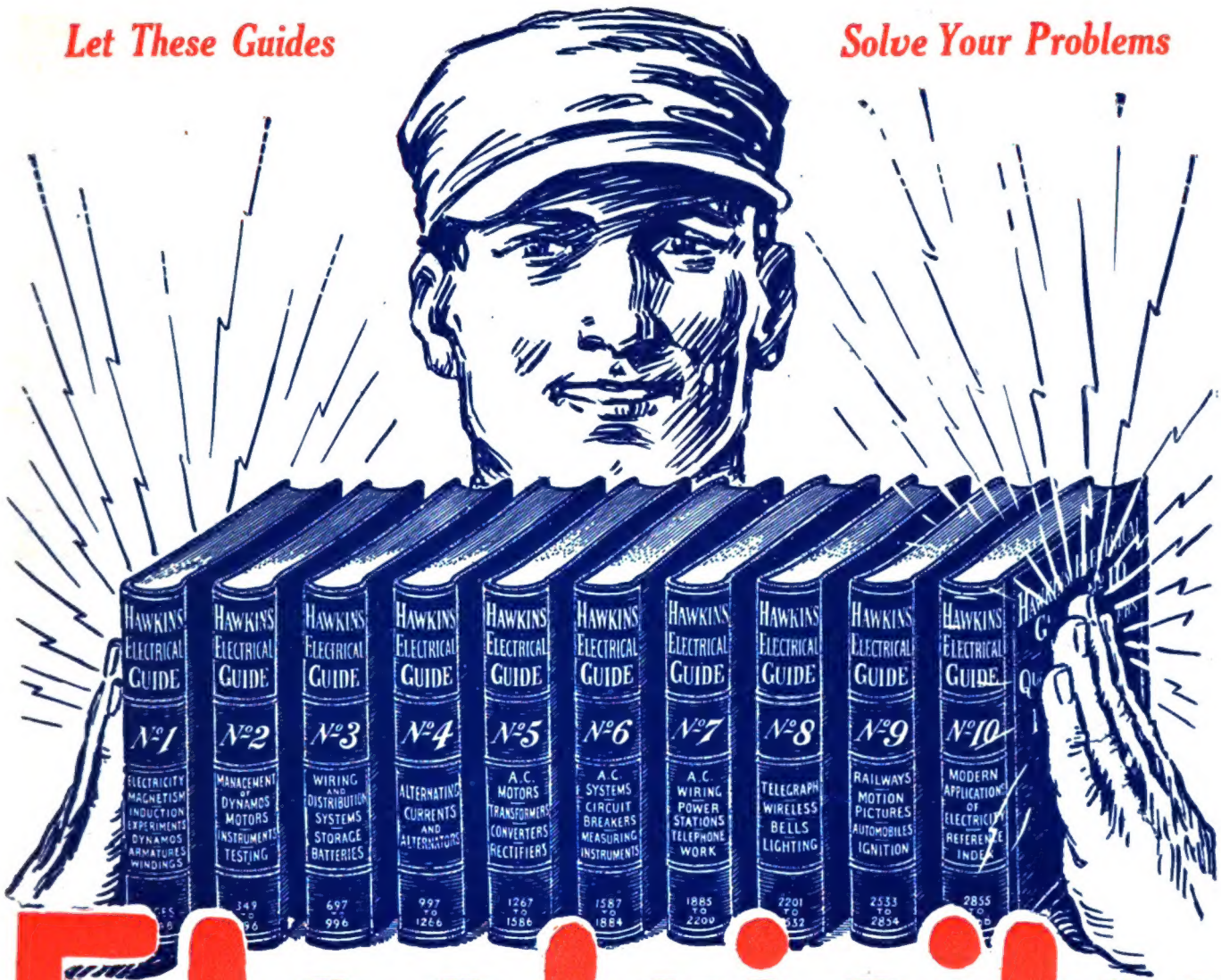
The book, called the "Burgess Blue Book," is published and sold by us for one dollar ($1.00) per copy, postpaid. If you wish one of the books, send us your order with a dollar bill, check or money order. We know the value of the book and can guarantee its satisfaction to you by returning your money if you decide not to keep it after having had it for five days.

THE McCLURE PUBLISHING CO. **726 Cass St., CHICAGO, ILLINOIS**



Digitized by Google
Original from UNIVERSITY OF CHICAGO

Let These Guides *Solve Your Problems*



Electricity at your finger ends

HAWKINS ELECTRICAL GUIDES IN TEN VOLUMES

8500 PAGES **$1 A VOLUME**
4700 PICTURES **$1 A MONTH**

SEND NO MONEY—SEND ONLY THIS COUPON

Know the facts in Electricity. They mean more money and better position for you. Hawkins Guides tell you all you need to know about Electricity. Every important electrical subject covered so you can understand it. Easy to study and apply. A complete, practical working course, in 10 volumes. Books are pocket size; flexible covers. Order a set today to look over.

LEARN ALL ABOUT

Magnetism—Induction—Experiments — Dynamos — Electric Machinery—Motors—Armatures—Armature Windings—Installing of Dynamos—Electrical Instrument Testing—Practical Management of Dynamos and Motors—Distribution Systems—Wiring—Wiring Diagrams — Sign Flashers — Storage Batteries — Principles of Alternating Currents and Alternators — Alternating Current Motors —Transformers — Converters—Rectifiers—Alternating Current Systems — Circuit Breakers — Measuring Instruments—Switchboards—Wiring—Power Stations—Installing —Telephone—Telegraph—Wireless—Bells—Lighting—Railways. Also many Modern Practical Applications of Electricity and Ready Reference Index of the ten numbers.

SHIPPED FREE

Not a cent to pay until you see the books. No obligation to buy unless you are satisfied. Send Coupon now—today—and get this great help library and see if it is not worth $100 to you—you pay $1.00 a month for ten months or return it.

THEO. AUDEL & CO.,
72 Fifth Ave., New York City

Please submit me for free examination, HAWKINS ELECTRICAL GUIDE (Price $1 a number). Ship at once prepaid, the 10 numbers. If satisfactory, I agree to send you $1 within seven days and to further mail you $1 each month until paid.

Name .....

Occupation .....

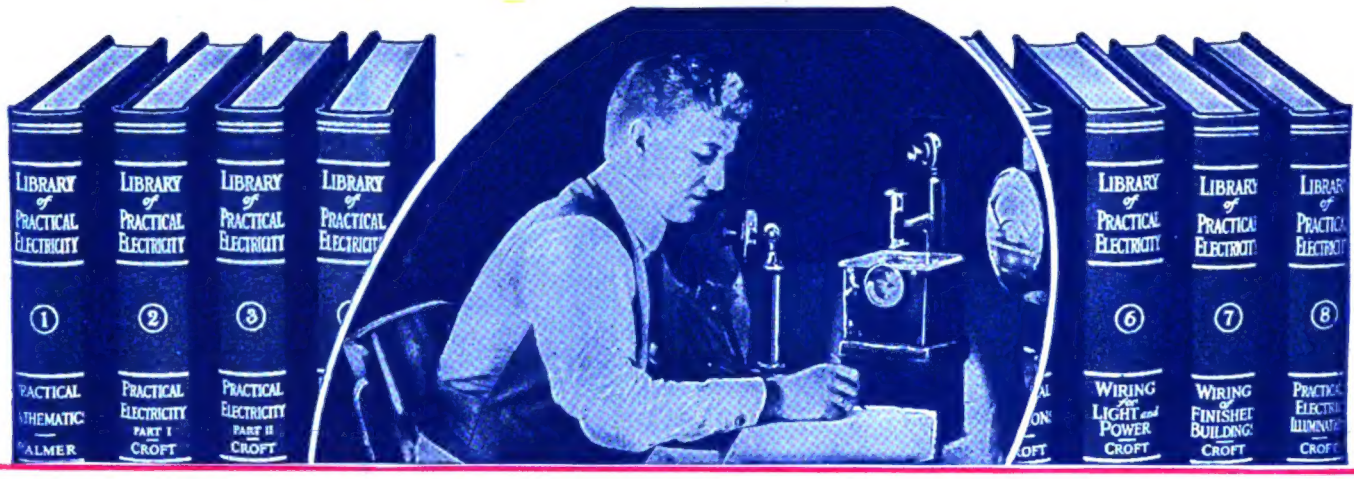
Employed by .....

Home Address .....

Reference .....

S.I. May

Digitized by Google
Original from UNIVERSITY OF CHICAGO



These books will help you win a big-pay job!

THE Croft Books bring the big-pay job within your reach. They teach you electricity as practised by experts. They take you out of the crowd and fit you for more responsible positions—they give you a short cut to Success in the electrical field. Forty thousand men are using these books to step ahead—WHY NOT YOU?

The Croft books were written by a man who has spent 20 years in electrical work. He has done the work you are doing now and has risen to his present position in the electrical world simply by studying his job.

Croft knows how to teach electricity—how to fit men for big-pay jobs—because he knows just what is needed to get ahead. What he knows about electrical practice has been gained by actual shirt-sleeve contact with every-day electrical problems.

The Croft Library of Practical Electricity

(A combined home-study course and reference library)

8 volumes—3000 pages—2100 illustrations—flexible Keratol binding

THERE is plain evidence before us that opportunities in the world of electricity are increasing constantly. Today there are more big-paying positions open than at any time in the history of electricity—even during the high production period of the war. New uses are being found for electricity every day, and the progress of the world more and more depends upon it.

Terrell Croft is doing his share in teaching men the correct principles of electrical practice. He knows the game from experience. He has poured out all his knowledge, all the short cuts, all the time savers, in language that anyone can easily grasp. Yet the text is so scientifically correct that thousands of the highest paid electrical engineers are using the books as a reference set.

Thousands of problems at your fingers' ends

Three thousand pages, with twenty-one hundred of the clearest illustrations ever put into book form. Each of the eight volumes is indexed so that everything you want to know about electricity is at the fingers' ends. And when you find what you want, there is not merely a short question and a short answer. You are told everything you want to know. The explanation is clear to you, regardless of whether you have had a previous knowledge of electricity or not.

Croft teaches you electrical practice complete. He takes you in quick, easy steps from the simplest principles to the complete and economical operation of a great central station.

He tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, current, switch-boards, distribution systems—electrical machinery—wiring for light and power—wiring of finished buildings—underwriters' and municipal requirements—how to do a complete job, from estimating it, to completion—illumination in its every phase—the latest and most improved methods of lighting—lamps and lighting effects, etc.

No other course or set of books sticks so closely to actual practice as the Croft Library. It is complete—it is up to date—it is practical—it is easily understood. It contains a mine of methods and working details. It tells you all that Croft has learned in twenty years of shirtsleeve practice. It enables you to master electricity quickly and thoroughly—to know it as experts know it.

In these eight books Croft gives you the essentials of a complete electrical education—he gives you the sound, hardheaded facts you need to fit yourself for a bigger job with bigger pay.

Free examination—no money down—only $1.50 in ten days and $2.00 a month until paid

The Croft Library has always been the leader among the higher grade electrical libraries. At its new price of $19.50 it is the biggest value in electrical books on the market. Men who are using Croft will tell you that no set of electrical books published, regardless of price, can equal the Croft Library in completeness, up-to-date-ness and all-round practical value. The price is cut, but not the value.

Fill in and mail the coupon attached and we will send you the entire set of eight volumes for ten days' Free Examination. We take all the risk—pay all charges. You assume no obligation—you pay nothing unless you decide to keep the books. Then $1.50 in ten days and the balance at the rate of $2.00 a month. Send the coupon NOW and see the books for yourself.

Send the coupon and see these great electrical books for 10 days FREE!

FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York

Gentlemen:—Send me the LIBRARY OF PRACTICAL ELECTRICITY (shipping charges prepaid), for 10 days' free examination. If satisfactory, I will send $1.50 in ten days and $2 per month until $19.50 has been paid. If not wanted, I will write you for return shipping instructions. (Write plainly and fill in all lines.)

Name .....

Home Address .....

City and State .....

Firm or Employer .....

Occupation S.I.-5-24

This coupon starts you to bigger pay!

Digitized by Google
Original from UNIVERSITY OF CHICAGO